EPA-908/9-83-001

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Region 8
1860 Lincoln Street
Denver, Colorado 80295

Colorado Montana,
North Dakota, South Dakota,
Utah, Wyoming

Regional Administrator May, 1983 EPA-908/9-83-001

EPA

ENVIRONMENTAL MANAGEMENT REPORT

1983

United States
Environmental Protection
Agency

Region 8
1860 Lincoln Street
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North Dakota, South Dakota,
Utah, Wyoming

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ENVIRONMENTAL MANAGEMENT REPORT

1983

Compiled by
Technical and Program Staff
EPA Region VIII Offices in Denver

U.S. Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, CO 80295
(303) 837-2351

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VIII

1860 LINCOLN STREET

DENVER, COLORADO 80295

MAY 27 1983

Ref: 8PM-MSA

MEMORANDUM

TO: Lewis S.W. Crampton, Director
Office of Management Systems Division

SUBJECT: Region VIII's Environmental Management Report

I am pleased to enclose Region VIII's Environmental Management Report for 1983. Compiling this report was a cooperative, region-wide effort involving many technical and program staff.

A Region VIII "EMR Workgroup" was formed of one or more staff members from each of the eight media, and several members of the region's data analysis staff. To compile this report, Region VIII staff conducted an exhaustive analysis of the available data on environmental conditions in the six Region VIII states of Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming. Data from nearly a score on environmental monitoring networks were reviewed.

We have made an effort to assure that this report documents current environmental conditions as a "baseline" of environmental quality in Region VIII. The success of this report will be measured in the short run by how well EPA's managers use the data and conclusions in this report to help focus abatement and prevention efforts more directly on the most significant problems in the region. For the long term the greatest value of this report may be that it establishes a benchmark against which future environmental conditions can be measured.

We wish to acknowledge the considerable help and constructive suggestions provided by technical experts and program staff in each of the six Region VIII states and in the EPA Headquarters program offices. To the extent possible we have incorporated suggested changes and corrections, and we believe that the final Region VIII Environmental Management Report will meet the need of EPA managers for an internal agency management tool which provides an accurate and current status report of the region's major environmental concerns.

We also wish to acknowledge the national coordination and guidance provided for the Environmental Management Reports by your Envrionmental Results Branch. We especially enjoyed working with Sherry Hiemstra and Bill Garetz whose thoughtful direction produced an innovative report on envioromental conditions in each of the nation's ten regions.

Robert Simmons

Robert A. Simmons
Director, Office of Management
Systems and Analysis

Attachment

DISCLAIMER

This report has been reviewed by the Office of Management Systems and Analysis, the Air and Waste Management Division, the Water Management Division, and the Environmental Services Division at the Region VIII (Denver) offices of the U.S. Environmental Protection Agency and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

DISTRIBUTION STATEMENT

This report may be obtained by calling or writing the Office of Management Systems and Analysis in the EPA Region VIII office in Denver. Telephone: (303) 837-2351. File copies of this report are also available for public review in the Library of the Environmental Protection Agency's Region VIII office at 1860 Lincoln Street, 1st Floor, Denver, Colorado 80295. Telephone: (303) 837-2560.
This report is also available to the public through the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 22161.

INQUIRIES AND CORRECTIONS

While considerable effort has been extended to assure the accuracy of information in this report, there may still be data or other information which remains inaccuarate. We welcome reviews of the information presented here, whether they be specific data points or nuances of interpretation. Comments, questions, suggestions or corrections may be directed to Mr. Paul Riederer, EMR Project Director, Office of Management Systems and Analysis, Environmental Protection Agency, Region VIII Offices, 1860 Lincoln Street, Denver, Colorado 80295

PREFACE

During 1983, each of the ten Regional Offices of the U.S. Environmental Protection Agency, in consultation with State counterparts, prepared an Environmental Management Report based on available environmental data. This report is one of ten reports compiled for internal EPA decision making and management purposes. It is intended as a step toward developing a revised and updated baseline of environmental conditions.

This report describes the general status of and trends in environmental quality in Region VIII (Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming). The report is an intermedia assessment of the most significant environmental problems in the region. It identifies current and emerging problems requiring abatement or prevention. It also identifies the causes associated with these problems, where known, and the barriers to solving the problems. The implications of this information for regional and national environmental protection strategies over the short and long term are addressed. The report indicates actions the Region has completed and planned to address the environmental problems cited. The report also describes the assistance required by States and the Region from EPA, Headquarters and other sources to deal effectively with these problems.

ABSTRACT

This report documents current environmental conditions as a "baseline" of environmental quality in Region VIII. The report was compiled by Staff at the Environmental Protection Agency's Denver office to help target abatement and prevention efforts more directly on the most significant pollution problems in the region, and to establish a benchmark against which future environmental conditions can be measured.

To compile this report, Region VIII staff conducted an exhaustive analysis of the available data on environmental conditions in the six Region VIII states of Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming. The staff reviewed data from nearly a score of environmental monitoring networks.

Criteria were agreed upon nationally for defining "significant" environmental problems in each of eight media: air, surface water, ground water, drinking water, hazardous wastes, toxics, and pesticides. Computer-enhanced analysis of pollutant parameters was used to break down a vast array of data, apply the problem selection criteria, and identify the most significant problems in a location-by-location geographical analysis.

After Region VIII staff refined and applied the criteria, reviewed the data, and reached preliminary conclusions, they compiled a comprehensive list of the Region's significant pollution problems, medium-by-medium, state-by-state, and site-by-site. The causes of the region's pollution problems were identified, where possible, and barriers to solving the problems were listed. Program staff and media leads identified actions the regional office or state pollution control agencies have taken or planned to address the pollution problems cited. They also identified what assistance the States and the Region require from EPA Headquarters offices to deal effectively with regional pollution problems.

This report analyzes data covering a period from approximately 1977 and prior up through 1982. It was completed in May, 1983.

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Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, CO 80295
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ACKNOWLEDGMENTS

This report was made possible because many people were willing to bring their years of training, experience and professional judgement to bear on the interpretation of a complex array of data compiled over nearly a decade through local, state and federal environmental monitoring networks.

Particular credit is due to the individual technical and program staff in Region 8 who cared enough about environmental results to make this initial pilot project accurate and worth referencing. The fact that this report can be used as a benchmark against which future environmental conditions can be measured in Region VIII is due in large part to the following individuals.

Paul Riederer (Project Director); Tom Entzminger (Data Analysis); John Giedt and Paul Wagner (Radiation); Diane Groh (Pesticides and Toxics); David Joseph (Air Quality); Dave Lewis (Data Analysis); Nancy McTigue (Drinking Water Quality); Jon Minkoff (Hazardous Waste, Active Sites); John Wardell (Hazardous Waste, Inactive Sites); Bill Tabor (Data Analysis); Tom Willingham, Diane Wynne, Cece Forget and Denise Link (Water Quality); Wes Wilson (Ground Water Quality); many other technical and program staff too numerous to mention; and the clerical and secretarial staff whose patience and skills made it possible, despite the vicissitudes of electronic-age word processing equipment, to produce this document in a timely and orderly fashion.

We wish to acknowledge the considerable help and constructive suggestions provided by technical experts and program staff in each of the six Region VIII states and in the EPA Headquarters program offices. To the extent possible we have incorporated suggested changes and corrections, and we believe that the final Region VIII Environmental Management Report will meet the need of EPA managers for an internal agency management tool which provides an accurate and current status report of the region's major environmental concerns.

We also wish to acknowledge the national coordination and guidance provided for the Environmental Management Reports by the Environmental Results Branch of the Office of Management Systems and Evaluation in EPA headquaters in Washington, D.C. We especially appreciate the efforts of Sherry Hiemstra and Bill Garetz whose thoughtful direction produced an innovative report on environmental conditions in each of the nation's ten regions.

INTRODUCTION

This report documents current environmental conditions as a "baseline" of environmental quality in Region VIII. The success of this report will be measured in the short run by how well EPA's managers use the data and conclusions in this report to help focus abatement and prevention efforts more directly on the most significant problems in the region. For the long term the greatest value of this report may be that it establishes a benchmark against which future environmental conditions can be measured.

EPA's Environmental Management Reports

In November of 1982 EPA's Assistant Adminsistrator for Policy and Resource Management directed each regional office by May, 1983 to prepare an intermedia assessment of the "most significant environmental problems" in the region. The expressed purpose was to identify program and resource priorities more clearly so that the agency could do a better job of "managing for environmental results."

The regions were specifically asked to prepare detailed reports ranking regional environmental problems in priority order and describing the resulting implications for regional and national environmental protection strategies.

The environmental management reports (EMR's) are planned as an agency pilot project for Fiscal Year 1983. In future years the EMR's may be linked directly to development of agency budgets, program and operating year guidance, state/EPA agreements and grant negotiations, as well as agency goals and performance standards.

Compiling the EMR in Region VIII

Compiling this report in Region VIII was a cooperative, region-wide effort involving many technical and program staff. A Region VIII "EMR Workgroup" was formed of one or more staff members from each of the eight media, and several members of the region's data analysis staff. The primary responsibility for direction and coordination of the EMR in the region was with the Office of Management Systems and Analysis, with data analysis support provided by the Environmental Services Division, and the bulk of the research and analysis conducted by "media leads" in the Air and Waste Management Division and the Water Management Division.

Sources: Environmental Monitoring Networks and Data Bases

In conducting research for this report, Region VIII staff made an exhaustive analysis of the available data on environmental conditions in Region VIII. Data from over a score of environmental monitoring networks were reviewed. Sources included reports such as the Water Quality Reports prepared by each state as required by Section 305b of the Clean Water Act. Sources also included data bases such as STORET (STOrage and RETrieval of Water Quality Data), SAROAD (Storage And Retrieval Of Aerometric Data), FRDS (Federal Reporting Data System for the drinking water program), NEDS (National Emissions Data System), and other data bases maintained by local, state and federal pollution control agencies.

Criteria Definition and Problem Identification

Within each of the eight media, Region VIII staff identified problems requiring abatement, potential degradation problems requiring prevention, and emerging problems, for which little documentation exists but which will be cause for concern in the future.

For example, specific geographic areas with air quality problems were identified by reviewing monitoring data for criteria pollutants, non-criteria pollutants, visibility, acid deposition, and other measures. "Significant" abatement problems were identified in areas where the data indicate that, for the pollutant in question, ambient standards are being violated and it is anticipated that standards will continue to be violated past the statutory attainment dates. Serious potential for degradation of air quality was identified where growth in emission levels was projected to occur at a rate that would result in either the available PSD increment being consumed or ambient standards being violated within ten years.

As another example, "significant" water quality problems requiring abatement were identified in those stream segments or water bodies where pollutant concentrations were so high that one or more of the designated beneficial uses were impaired. Serious potential for water quality degradation was indicated where current uses were being met but there was evidence that the current uses were liekly to be threatened in the future.

Computer-enhanced analysis of pollutant parameters was used to break down a vast array of data, apply the problem selection criteria, and identify the most significant problems in a location-by-location geographical analysis.

Analysis and Conclusions

After Region VIII staff refined and applied the criteria, reviewed the data, and reached preliminary conclusions, they compiled a comprehensive list of the Region's significant pollution problems, medium-by-medium, state-by-state, and site-by-site. The causes of the region's pollution problems were identified, where possible, and barriers to solving the problems were listed. Program staff and media leads identified actions the regional office or state pollution control agencies have taken or planned to address the pollution problems cited. They also identified what assistance the States and the Region require from EPA Headquarters offices to deal effectively with regional pollution problems.

The following section is an Executive Summary of the major problems and conclusions in each program area. Following that are the eight media sections of the report.

EXECUTIVE SUMMARY
REGION VIII ENVIRONMENTAL MANAGEMENT REPORT

I. AIR QUALITY

Region VIII air quality problems are categorized into two classes: those associated with the urban/industrial nonattainment areas and those associated with the emerging development of natural resources near PSD (Prevention of Significant Deterioration of Air Quality) Class I areas.

Major Air Quality Problems: Particulates and Carbon Monoxide

Total Suspended Particulates (TSP) was still the most widespread problem in the Region in 1981, although carbon monoxide (CO) concentrations in the region's populated areas continue to be the most aggravating problem affecting the most people.

Of the 49 counties in the Region in 1981 having monitoring stations reporting pollutant levels in excess of the primary standard, 31, or 63% of those were for TSP exceedances while 9, or 19% were for excessive CO concentrations; 6 were for O_3 (ozone); 1 for SO_2 (sulfur dioxide); 1 for NO_2 (nitrogen dioxide); and 1 for lead.

Major Causes of Carbon Monoxide and Barriers to Attainment

The CO problems in Colorado (Metro-Denver, Fort Collins, Greeley, and Colorado Springs), Utah (Salt Lake City), and Montana (Missoula, Billings, and Great Falls) are caused by mobile sources. The principal barrier to achievement of the CO standard is the lack of enough effective and enforceable transportation control strategies that have acceptable costs and do not entail severe social impacts.

Major Causes of TSP and Barriers to Attainment

The TSP problems in the Region are generally caused by auto and truck exhaust, power plants, smelters, steel plants, unpaved roads, and construction work. The principal barriers to achievement of the TSP standard include: (a) the difficulty and the cost of controlling the nontraditional sources, such as fireplaces, wood stoves, street cleaning, sanding, construction work, etc. (b) the dry, windy conditions typical in Region VIII which encourage the reentrainment of fugitive dust, and (c) the uncertainties resulting from the proposed change to an inhalable particulate standard.

Ozone

The metropolitan Denver and Salt Lake City areas are the only two areas in Region VIII that are nonattainment for ozone. The ozone problem is predominately caused by motor vehicle emissions, e.g., in Denver about 80% of the VOC and 30% of the NO_x emissions are from mobile sources. EPA Region VIII expects both Denver and Salt Lake City to be able to meet the ozone standard by 1987.

Lead

Lead is emitted from point sources, fugitive smelter sources, and also reentrained from streets and soil from areas that have been contaminated for years. The ASARCO lead smelter in East Helena, Montana is causing violations of the lead NAAQS. The principal barrier to achievement of the lead standard is the cost of cleaning up the causes of the problem. The State of Montana plans to submit a SIP revision for attainment of the lead standard in the spring of 1983. Region VIII requests assistance in several areas.

Acid Deposition and Other Air Pollution Effects on the Air Quality Related Values of Class I Areas.

The Federal Land Managers of Class I areas have been given the affirmative responsibility by the Clean Air Act to protect the air quality related values of the lands they manage. Air quality related values (AQRV) include visibility, flora, fauna, soils, and water. The PSD regulations require the impacts of PSD sources emissions on a Class I area's AQRV to be investigated and quantified. If a proposed PSD source will cause adverse impacts on the AQRV of a Class I area, the PSD permit can be denied.

Presently, AQRV are of particular concern for the Colorado Flat Tops and Mt. Zirkel Wilderness areas and the North Dakota Theodore Roosevelt National Park. The former areas may be adversely affected by large scale development of oil shale reserves. New power plants, synfuel plants, and oil and gas fields are threatening the AQRV of Roosevelt National Park.

Acid deposition may already be a problem in the high altitude lakes in Colorado. These high altitude lakes are extremely sensitive to changes caused by acid deposition. Two limited Colorado studies suggest that several lakes have already been affected by acid deposition caused by SO_2 and NO_2 emissions.

Regional visibility impairment in Flat Tops Wilderness and Colorado's western slope may also result from large scale industrial development.

The principal barriers to the adequate analysis of the effects of acid deposition and other air pollutants on AQRV are: a) the lack of adequate predictive modeling tools that attempt to quantify the source receptor relationships between acid deposition and other pollutants, and AQRV, and b) the lack of adequate data to define baseline conditions for various air quality related values, such as the baseline conditions of high altitude lakes in the Flat Tops Wilderness.

Distribution of Air Quality Problems Across the Region

Colorado has six urban/industrial nonattainment areas. Of the six, metropolitan Denver is the most significant problem area in terms of affected geographic area, frequency of alerts and violation days, and magnitude of pollutant levels for TSP, CO and O_3. In Montana, CO, TSP, and lead are the pollutants of most concern. North Dakota has no nonattainment areas. A very significant air quality management problem in the State, however, has been the predicted consumption of the PSD Management Class I SO_2 increment at the Theodore Roosevelt National Parks. South Dakota's only nonattainment area is Rapid City, where TSP is the problem. The Wasatch Front (Salt Lake, Weber, Davis, Utah, and Tooele Counties) is the area in Utah with the most significant air pollution problems. Utah, like Colorado has significant natural resources which are being developed in PSD clean air areas. Sweetwater County, Wyoming, the State's only nonattainment area (for TSP), is believed to have achieved attainment by the end of 1982.

Potential Air Quality Problems on Indian Reservations within Region VIII.

Indian tribes in Region VIII are generally very interested in preserving their excellent air quality. The Northern Cheyennes (MT) and Flathead Indians (MT) have already redesignated their reservations to PSD Class I. Development of energy resources near the reservations may create Class I or Class II PSD increment violations on the reservations. Other reservations, such as the Crow Indian Reservation are interested in developing their mineral resources. Such development can produce air quality problems on their reservation as well as on neighboring lands. Presently, EPA grants are being used by Indian tribes for baseline data collection, regulation, development, and PSD area redesignation studies.

Emerging Air Quality Issues: Acid Rain, Indian Lands, Transport Models and Visibility Deterioration

Looking to the future, a list of emerging air quality issues in Region 8's Rocky Mountain and Northern Plains states includes: (1) Acid deposition; (2) Emissions from diesel vehicles; (3) Organic compound and particulate emissions from wood stoves and fireplaces; (4) Indoor air pollution; (5) Availability of complex terrain and long range transport and diffusion models; (6) Cadmium and arsenic levels in East Helena; and (7) Potential air quality problems on Indian Reservations within Region VIII.

II. WATER QUALITY

The Water Quality Section of our Environmental Management Report presents for each state a narrative description of the more significant water quality problems. It provides maps showing priority problem areas, with tables designating the priority stream segments, and listing the water quality problems by source category.

Region VIII enjoys generally high water quality. We are committed to restoring water quality where it has been degraded and preserving the existing high quality waters which are so valuable to the people of this Region.

Data Gap: More Monitoring and Biological Data is Needed

Water quality in Region VIII streams is highly correlated with seasonal fluctuations in the natural hydrologic cycle and it is often difficult to obtain clear indications that impaired beneficial uses are due to high concentrations of chemical or other non-natural pollutants. Even so, a more serious impediment to detecting provable trends of water quality is the scarcity of regular monitoring data from potential problem segments. The most significant data gap in Region VIII is that biological data is virtually absent. This deficiency will greatly hinder Region VIII's ability to develop recommendations for site-specific water quality standards and to evaluate whether designated uses are realistic.

Some Beneficial Uses of Water Are Impaired

Aquatic life protection uses and recreational water uses are the uses most frequently impaired by pollution in Region VIII. To a lesser extent, waters designated for use as a public water supply and for agricultural use are also impaired. Fecal coliform from nonpoint sources and inadequately treated wastewater cause frequent recreational use impairments. Sediment, nutrients and salinity are the parameters which are responsible for most of the use impairment observed in Region VIII.

Few Uses Are Severely Impaired, Making Water Quality Very High in Region VIII

The quality of surface waters in Region VIII is quite good. Less than half of the designated beneficial uses are moderately impaired and less than 10% of designated beneficial uses appear to be severely impaired. In fact, one challenge we face is to maintain the high quality of waters in this region.

Municipal Wastewater Pollutants Have Greatest Impact of Aquatic Life

Un-ionized ammonia, low dissolved oxygen and elevated nutrients are the parameters associated with municipal wastewater treatment facilities which appear to be having the greatest effect on aquatic life. Cadmium, copper, lead and zinc contamination from active, inactive or abandoned mining operations are also suspected of having severe effects on aquatic life.

Non-Point Sources Account for 90% of the Region's Water Quality Problems

Nonpoint source pollution constitutes the principal cause of the water quality problems in Region VIII, with some states reporting that over 90% of their water quality problems are due to natural and human-induced nonpoint source pollution.

The Region's Major Water Quality Problems

Several observations summarize Region VIII's water quality problems:

- Nonpoint source loadings of nutrients, sediment and salinity constitute the major causes of water quality standards violations in Region VIII.

- Municipal discharges of ammonia, chlorine, organic material and bacteria present the greatest impediment to achieving the 1983 fishable/swimmable goals of the Clean Water Act.

- Discharges of heavy metals from inactive/abandoned mines present the greatest nonmunicipal source of toxics which threaten the fishable goal of the Clean Water Act.

For the Future: Protecting High Quality Waters...

Implementing pollution control regulations on high quality waters has been difficult in Region VIII. Many of the water bodies in Region VIII are of high quality, i.e. those with quality better than the 1983 goals, and the Region is in the process of developing a procedure to: 1) define existing quality through a computerized, flow-weighted analysis, and 2) define significant change in existing quality. Because most of our (State and EPA) monitoring efforts have been concentrated in areas where we have water quality problems, the lack of water quality data and flow monitoring are frustrating our efforts in high quality areas.

...and Redirecting Programs from Control Technology Based Programs to Beneficial Uses

One major programmatic implication apparent to Region VIII managers is that lack of sufficient funds, qualified personnel and data, especially biological data, are the major obstacles which impede the successful implementation of the use-oriented water quality control program articulated in the proposed regulations. For the past ten years EPA and the states have directed program funding, resources and data collection toward a treatment-technology-based control program. Little attention has been directed toward the beneficial-use-oriented control strategies envisioned in the proposed regulations. As a result, State personnel and regional EPA staff will have to be creative, adaptive and assertive enough to redirect existing programs to accomodate these new strategies as they are developed and focus on a water quality control program which is oriented to preserving and restoring beneficial uses of the region's water resources.

III. DRINKING WATER QUALITY

In Region VIII's six states, there are 3,136 community water systems serving 7,463,000 people and 5,536 non-community water systems serving a non-resident population of approximately 700,000 people. Most of these systems are small and use ground water as a source of supply.

Region VIII is characterized by its rural nature, having over 7 million people scattered across 578,000 square miles of land; or roughly 13 people per square mile. One third of these people live in cities greater than 100,000, but most of Region VIII is made up of small towns. Seventy percent of the community water systems in the region serve fewer than 1,000 people; ninety-nine percent of these community water systems serve fewer than 100,000 people.

Small System Problems Predominate in Region VIII

State and nationwide studies have shown that small water systems (those serving fewer than 1,000 people) are the systems which have the most problems in consistently providing safe drinking water. Typically, these systems rely on untreated ground water, unfiltered surface water or poorly protected springs for their source of supply. This, in combination with low water rates that can not support improvements or adequate operation, result in public health dilemmas.

Coliform Bacteria Violations Have Decreased

Throughout the region, coliform bacteria violations, both maximum contaminant levels (MCL) and monitoring and reporting violations, have decreased between October 1978 and the present. The number of monitoring violations is substantially higher than the number of MCL violations. In fiscal year 1981, 30% of the systems failed at some time either to monitor or to report a violation.

During FY '79, there were 634 violations of the maximum contaminant level (MCL) for bacteria throughout the Region. Since that time, these violations have decreased markedly. This trend, attributable to improved treatment and sampling techniques, is encouraging since the presence of coliform bacteria in drinking water is an indication of the disease-causing potential of the drinking water.

Persistent Violators of Bacteria MCL Have Decreased to 10%

What is of more concern than simply the number of violations, is the number of systems that are considered persistent violators. These systems violate the bacteria standard for 4 or more months in a year, or more than one quarter in a calendar year. The percentage of persistent violators has decreased from 19% (1979) to a 1982 level of 10%. However, this percentage still represents a sizable portion of the systems which are consistently out of compliance.

Turbidity Increases Potential of Giardiasis, Especially in Small Systems

Unfiltered water sources are a particular problem due to the occurrence of high turbidity during run off periods which interferes with disinfection and increases the presence of chlorine resistant Giardia lamblia cysts. In the past 3 years, 17 outbreaks of giardiasis have occurred in the region, most of them in small systems.

Turbidity Compliance Has Improved

In FY 1979, 81% of the surface waters in the region met all the requirements of the turbidity regulations. Persistent violators represented 9% of all systems. Compliance has improved by 8% so that in FY 1982, 89% of the systems were in compliance, and the percentage of persistent violators was decreased to 5%.

Inorganic and Radiological Chemical MCL Violations

A number of systems have been found to exceed the standards set for inorganic chemicals. Over one hundred communities, 3% throughout the region, have been found to be in violation of these standards.

Currently there are 86 communities in Region VIII exceeding the fluoride MCL, 33 exceeding the nitrate MCL, 8 exceeding the selenium MCL and 5 communities exceeding the arsenic standard. These contamination incidents are results from the presence of natural contaminants in deep aquifers, or from poor well drilling practices which lead to nitrate contamination. All of these contaminants are known to have public health implications.

Trihalomethanes (THM) + Other Organic Chemicals May be a Problem in the Future

In Region VIII only 106 systems are large enough to test for trihalomethanes. This group of organic chemicals, suspected carcinogens, has been found in levels higher than the MCL in only 2 systems. More systems are expected to find this chemical as sampling is completed. A change in treatment technique may be required for removal.

In an attempt to determine the extent of occurrence of volatile organic chemicals in ground water systems, the Office of Drinking Water Headquarters conducted a study of ground water sources throughout the country in 1980 for Region VIII systems. Over half of the samples tested contained trace amounts of either trihalomethanes or volatile organic chemicals. Eighteen percent of the systems contained only trace amounts of volatile organics. This is slightly better than the national average of 24%.

Drinking Water Quality on Indian Lands

Numerous Indian tribes have traditionally made their home in the six state region comprising Region VIII. Presently, 25 tribes reside on 23 Indian Reservations. Inadequate treatment and little, if any, operation and maintenance contribute to the problem of intermittent quality of drinking water on Indian Reservations.

Additional Contaminants

The extent of present contamination of drinking water is only beginning to be discovered. Chemicals for which there are no MCLs, no sampling requirements and in some cases, difficult detection procedures, continue to be discovered in aquifers and surface waters feeding Region VIII drinking water systems.

Measures to Get Better Water to Drink

By increased treatment, blending or changing sources, improvements in some communities' drinking water have been made. In South Dakota, for example, of the estimated 95 communities in violation of standards, including those for inorganic chemicals, 22 have corrected the problem and 28 have approved preliminary plans to correct their problems. Regionwide the improvement rate is not quite so impressive, since less than 37% of the violating systems have improved or have developed plans to make improvements.

IV. GROUND WATER QUALITY

90% of the Region Relies on Ground Water

In the region's six states, there are 3,136 community water systems and 5,536 non-community water systems, of which over 90 percent obtain all or part of their supplies from ground water aquifers. Approximately 95 percent of the region's population in the rural areas obtains their sole water supply from private wells.

Few Instances of Disease or Poisonings Have Been Reported

Few instances of waterborne disease or chemical poisoning due to contaminated ground water have been reported in the Region. This may be attributed in part to the fact that adverse health effects, resulting from low level exposure to organic and inorganic constituents are often not noticed over the short term and are seldom reported. Some of the risk, (such as nitrate exposure to pregnant women) is avoided by using bottled water. Additionally, hazardous waste contaminations have not yet occurred in areas of ground water use, and exposure has thus far been avoided.

Yet Surveys Show Observable Levels of Contaminants Throughout the Region

A survey conducted on a random sample of ground water systems in the Region in 1980 found traces of trihalomenthanes and volatile organics in 56 percent of the community well systems.

The regional agricultural areas suffer from saline increases due to irrigation practices notably in the Grand Valley, Uncompahgre Valley, the Arkansas Valley of Colorado, and the northeastern plains of Colorado in the Ogallala Aquifer and the Unita Valley of Utah.

Increasing concentrations of nitrates occur in the Big Sioux Valley of South Dakota and South Platte Valley of Colorado as a result of agriculture practices, municipal waste discharges, and old landfills in the floodplain.

Uranium concentrations are naturally high in South Dakota, Wyoming and Eastern Colorado, and are thought to be increasing due to land-use related activities along the North and South Platte basins of Colorado and Wyoming. High selenium, fluoride and uranium concentrations in the western portion of South Dakota, eastern Wyoming and northeastern Colorado caused by natural conditions, pose some long-term health risks.

Regional mining activities are adding heavy metals and salinity to the ground waters to the extent that several community wells have been abandoned in the Jordan River Valley of Utah as a result of salt increases suspected to be from the adjacent copper mining activity.

Local "hot spots" due to hazardous wastes, solid waste, leaking underground tanks, injection of oil and gas brines, acid mine drainage, and accidental industrial spills pose health risks for small isolated areas and for some sections of the heavily populated cities throughout the Region.

State Laws on Ground Water Protection are Inconsistent and Incomplete

At the state level, ground water is managed differently by each of the region's six states. All states but Utah have a ground water reference in their general statutes; while South Dakota and Wyoming have specific ground water laws. Only Wyoming has specific requirements for ground water quality and an aquifer classification system. Colorado supports the need for both specific standards and for an aquifer use classification system. None of the region's states have authority to limit ground water use based on deteriorating ground water quality although twenty other states in the country do have some such provisions.

Federal Laws and EPA Ground Water Policies Have Been Fragmented and Incomplete

At the federal level, ground water is not protected by any single legislative mandate, but is sporadically and only partially, protected by portions of some eight or ten federal pollution control laws. Hence, the Agency has neither a single ground water protection mandate nor a comprehensive set of policies and procedures with which to deal with ground water contamination problems.

Ground Water Strategy is Critically Needed in the Region and the Agency

Ground water supplies are becoming increasingly contaminated. While aquifers are geologically spread across state boundaries, state laws with regard to protecting ground water supplies are inconsistent and incomplete. Meanwhile, federal laws have not filled this gap. There is clearly an urgent need to develop a coordinated strategy for ground water use among states and between states and federal authorities.

Other Ground Water Needs: Centralize Data Base and Better Define Which Parameters Require Monitoring

There is also a need for a centralized ground water data base to better assess trends in ground water contamination and quality. Finally, there is also a need to more definitively develop the list of parameters for which monitoring should be required, so that adequate assessment of health risks can be made.

V. HAZARDOUS WASTES - INACTIVE SITES (SUPERFUND)

The Superfund report (Section V) analyzes the problems posed in the Region by inactive hazardous waste sites. Our report divides the subject into four categories - National Priorities List (NPL) sites , high priority sites not on the NPL, Federal facilities, and potential problem sites. The information is summarized, maps are used to show locations of sites, and bar graphs are used to show distribution between States and type of site (e.g., mining, radiation, chemical wastes).

How "Significant" Superfund Sites were Selected for this Report

Significant problems in Region VIII were easily identified for this report since one of the accomplishments of the Superfund program has been to assemble the National Priority List (NPL) of inactive hazardous waste sites. Sites at which the Region is or intends to negotiate formal agreements for clean-up were also considered to be significant problems even if they were not on the NPL (e.g., Lowry Landfill or Rocky Mountain Arsenal).

Location and Distribution of Region VIII's Superfund Sites

Region VIII has 14 sites on the proposed National Priorities List (NPL). Six are located in Colorado. Four are located in Montana. Utah, Wyoming, North Dakota, and South Dakota each have one site. The Region has mining sites and one radiation site in addition to the more traditional inactive and abandoned hazardous waste sites (i.e., landfills).

Region VIII also has sites that require attention even though they are not on the proposed NPL. These are Lowry Landfill, Denver; Canon City (Lincoln Park, Colorado); 2 radiation-contaminated structures in Monticello, Utah; Rocky Mountain Phosphate, Garrison, and the ASARCO smelter complex, East Helena, Montana.

Seven Federal facilities are actual or potential public health and environmental concerns to this Region. Three are located in Colorado: Rocky Mountain Arsenal (Denver) and Pueblo Army Depot (Pueblo) owned by the Army, and the Leadville Drainage Tunnel (Leadville) owned by the Bureau of Reclamation. Four Department of Defense facilities in Utah are also of concern. These are Dugway Proving Ground, Tooele Army Depot, Ogden Army Depot, and Hill AFB. In each case, actual or potential contamination of surface and ground water exists.

Region 8 has Made Significant Progress to Date in Cleaning Up Hazardous Waste Sites Throughout the Six-State Region.

At Whitewood Creek in the Black Hills area of South Dakota the contractors selected by the State, EPA, and Homestake Mining Company to complete the remedial investigation began field work in late March.

At the Arsenic Trioxide site in Southeastern North Dakota the State is continuing its remedial investigation under terms of our cooperative agreement with that state. This effort is on schedule.

For the Denver Radium Sites in Denver, Colorado, an action memorandum authorizing expenditure of about $220,000 of Superfund money was approved. The money will be used to complete the feasibility study.

At the Union Pacific/J. H. Baxter site in Laramie, Wyoming the settlement between the State and Union Pacific and Baxter to implement a remedial investigation and remedy has been started. The Region is expecting to initiate negotiations with the parties to undertake measures to abate contaminants leaking from unlined ponds concurrently with their remedial investigation.

At Rose Park in Salt Lake City, Utah the slurry wall surrounding the sludge pit has been constructed. The clay cap construction began in late April. Its installation is scheduled for completion in July.

At the Libby Ground Water site in Libby, Montana a potentially responsible party has verbally agreed to conduct a remedial investigation at this site beginning in May.

At the Anaconda Smelter in Anaconda, Montana an agreement with Anaconda provides for the company and EPA to perform a remedial investigation at the site.

For the Marshall Landfill in Boulder County, Colorado, Browning-Ferris Industries has verbally agreed to complete the remedial investigation, feasibility study, and remedy. A legal order will be completed soon to formalize this agreement.

Further Investigations will Determine Additional Remedial Actions Required

The Region will visit and assess the potential contamination problem at every known inactive or abandoned hazardous waste site in the Region during FY-83 and FY-84. Approximately 575 sites are listed within Region VIII. Of these sites, approximately 250 sites require some type of initial assessment. If past experience holds true, about 125 of these sites will require a visit to complete our evaluation.

Intermedia Impacts of Superfund Sites

Each of the 14 NPL-listed sites and Lowry Landfill, Rocky Mountain Arsenal, and the East Helena lead smelter impact on other media. Each impacts surface or ground water, or air, or perhaps several media. Other sections of this report, particularly Section IV on ground water, describe further impacts and implications of these abandoned or inactive hazardous waste sites in Region VIII.

VI. HAZARDOUS WASTES - ACTIVE SITES (RCRA)

Most of the information which we have on the environmental problems posed by active hazardous waste handlers dates from November 19, 1980, the start of the regulatory program developed under the Resource Conservation and Recovery Act (RCRA). Since that time, EPA has made progress toward defining, analyzing and abating those problems.

Significant Environmental Problems at Active Hazardous Wastes Sites in Region VIII

There are 73 hazardous waste management facilities in Region VIII which are required to conduct ground water monitoring. Many of them have exhibited serious ground water contamination problems as a result of inadequate disposal practices.

Oil refineries constitute one of the major types of hazardous waste producing industries in Region VIII and nearly all of the oil refineries have land disposal or land treatment facilities which are impacting ground water. Many refineries also have inactive hazardous waste (Superfund) sites resulting from past practices.

Recyclers of industrial waste chemicals pose significant problems because of a lingering history of unsafe hazardous waste management practices. Unmarked drums leaking waste directly onto the ground have not been uncommon for these types of facilities. Older recycling facilities are often located in densely populated, high-risk areas.

Mining wastes pose a significant environmental concern in Region VIII because of their volume and the likely possibility of surface and ground water contamination.

Region VIII Lacks Adequate Commercial Disposal Capacity

One of the major problems emerging in Region VIII is the lack of commercial capacity for disposal of hazardous wastes. For various reasons, including State siting laws as well as a lack of adequate facilities, the number of commercial disposal sites within the Region is much below current demand. The impacts of this gap include higher costs for waste shipments out of state and out of Region, higher liklihood of "midnight dumping", and a higher risk of accidents during long distance shipments of wastes.

A related problem is the "weeding out" of poorly operated facilities. Some facilities, especially the older recyclers, may not be able to come into compliance with the new standards for waste management under RCRA. The closing down of such operations may be considered an improvment since such poorly run facilities are no longer in operation. However, it also exacerbates the problem by further reducing the commercial waste management capacity within the Region.

Identification of Hazardous Waste Handlers

Over the last two and a half years EPA has identified the number and types of hazardous waste generators, transporters, and treatment, storage and disposal (TSD) facilities in the Region. One of the salient facts emerging from the notification figures is that over half of the total of 2521 notifiers have withdrawn from the regulatory program, due to exemptions or special requirements. There are some 1,093 commercial enterprises handling regulated hazardous wastes throughout Region VIII.

Correction of Unsafe and Improper Handling Practices

We have taken action to correct unsafe or improper handling practices. EPA and the States have conducted over 1,800 RCRA compliance inspections and 57 probable cause inspections resulting from (inspections resulting from citizen complaints, "midnight dumping" reports, and other sources). Improved handling practices have resulted both from in-field inspector recommendations and from formal enforcement actions. Through December of 1982 we have taken over 230 enforcement actions, including warning letters, complaints and final orders.

Improvement of Facilities Through Permitting

In October of 1981 Region VIII issued the first RCRA permit in the nation to the Oil and Solvent Process Company, a recycling facility near Denver, Colorado. It is important to issue permits for new facilities such as this in order to increase the Region's capacity for proper commercial treatment, storage and disposal of hazardous wastes. Region VIII personnel are in the process of permitting over 30 treatment, storage and disposal facilities and will continue to request Part B application at a rate of about three per month.

Positive Signs: Reduced Waste Volumes, Increased Recycling & Pretreatment

In the short period that EPA has regulated active hazardous waste handlers, certain trends have begun to emerge. We can point to some positive developments based on our contacts with the regulated community.

First, generators are changing their production processes in ways that reduce the amounts and volumes of wastes generated.

Secondly, there has been an increase in the recycling of hazardous wastes. This is not surprising, given the rising costs of proper disposal.

Finally, there is a growing trend toward the installation of pretreatment units, which then discharge non-hazardous waste into publicly owned treatment works. Although this eliminates the need for storage and transportation of wastes, it amplifies the need for an effective pre-treatment program.

VII. RADIATION

EPA's primary radiation role is to reduce unnecessary and avoidable radiation doses from environmental sources. Although the Agency has done some work in the area of discretionary sources where individuals are selectively exposed, the primary thrust has been with population exposure to ambient levels and avoidable increases to those levels.

Radiation Occurs Naturally, but Exposure Doses Have Been Increased by Technological Man

Most ambient radiation exposure occurs through natural events and media. However, this natural exposure has been exacerbated through many of the resource development and mining activities particularly prevalent in Region VIII. The major concern in Region VIII is this technological enhancement of naturally occurring levels of radiation and the resulting exposure to increased levels of radiation in the ambient environment in our Region.

Exposure to Radiation is Expected to Decline Significantly...

Some of the most significant reductions in environmental radiation dose to the Region VIII population are expected to occur during the next 5 to 10 years. Gamma rays are the radiation of interest with respect to external exposure to the body. The altitude of the Rocky Mountain Region as well as its mineralization result in elevated exposure from natural cosmic and terrestrial sources. As a result of improved practices which are to be required by proposed standards and regulations, the external radiation dose to the population, especially in the near vicinity of mines, mills and other operational sources, is expected to decline over the next few years.

Radiation dose to the internal organs of the body, resulting from ingested or inhaled radioactive material is of far greater concern because the doses are usually much greater than external doses and occur over longer periods, up to a lifetime. As with external exposure, the primary Regional role is closely involved with ensuring that these radiation doses will also decline as a result of controls required by the standards and regulations noted above. In addition, projects designed to remove radioactive contaminants from drinking water will further reduce the population dose. These internal dose reductions are expected to be far more significant than the reduction in external dose.

Except for Uranium in Drinking Water...

Unfortunately, we also anticipate a dramatic increase in radiation dose to some portions of the population. Uranium in drinking water remains a widespread problem in Region VIII. As mentioned above, much of the uranium in Region VIII drinking water occurs from natural causes, although amounts and volumes of uranium leaching into surface and sub-surface waters are increased by mining and other human activities. There are no regulations limiting uranium in drinking water because a cost-effective removal process has not yet been proven. Research in this area is proceeding.

...and Indoor Radon Progeny

Another significant concern with respect to future radiation protection lies with the internal dose resulting from inhaled radioactive radon decay product concentrations in the home. A popular and inexpensive energy conservation measure used by homeowners that can increase these concentrations is caulking. Caulking results in a decreased ventilation rate which can lead to elevated radon daughter levels. Since a person generally spends more time in his or her home than elsewhere, the increased risk of lung cancer associated with elevated radon progeny levels in the home can be significant.

Future Abatement Needs: Uncontrolled Radioactive Waste Sites and Uranium Mill Tailings

From an abatement perspective, our concern is with uncontrolled radioactive waste sites (we are investigating about two dozen abandoned sites) and with uranium mill tailings requiring remedial action (of 24 inactive uranium milling operations in the country, 16, or 67% are in Region 8).

Preventive Measures Needed: Radioactivity in Drinking Water and Indoor Radon Progeny

From a prevention perspective, we are most concerned with indoor radon progengy and radioactivity in drinking water. We are also concerned with developing strategies and sites to dispose of high level and low-level radioactive wastes.

VIII. TOXICS AND PESTICIDES

Long-Term Trend: Fewer Poisonings

Some very general long-term trends have been observed regarding pesticides and toxics issues in Region 8 to date. Generally, fewer pesticide poisonings seem to be occurring in recent years, possibly due to child proof pesticide containers and the fact that organophosphate pesticides are being respected for their acute hazard potential. We expect the year-by-year data in future Environmental Management Reports to reflect this trend. Definitive trends regarding pesticide drift and disposal of pesticide containers have not been observed.

Special Problems: Endrin Buildup, 1080 Coyote Control, and Pesticide Container Disposal

Certain Region VIII states are especially concerned with unique pesticide problems. Montana is concerned with the buildup of endrin residues in the environment and the buildup of certain pesticides in game birds. Wyoming, Montana, Utah, Colorado and South Dakota are very interested in the use of 1080 for coyote control, and if the Administrator allows the use of this chemical, EPA will have to work closely with the states to implement proper programs for its use. Requirements for pesticide drum storage and disposal will be tightened under RCRA. It is possible that these tighter requirements could mean an increase in illegal disposal of these drums and their contents.

Asbestos Exposure: Trends are Unclear

Regarding the asbestos-in-schools program, we are aware of several asbestos removals at schools but our data will not be compiled until our Asbestos Technical Advisor completes the second round of school district visits. After the mandatory rule requiring schools to keep records takes effect, we will have better figures on the exposure of school children to asbestos.

PCB's: Disposal Remains a Challenge

Methods of disposing of PCBs are still in the developmental stages and disposal costs remain high. However, significant quantities of PCBs are being moved into disposal facilities. We are beginning to gather actual figures on the flow of PCBs for disposal from Region VIII, and we will have more complete information in the future.

I.

Air Quality Section
Environmental Management Report

Air Quality Section
(continued)

Air Quality Section
Environmental Management Report

Part I:

A. Overview of Environmental Status and Trends

Region VIII air quality problems are categorized into two classes: those associated with the urban/industrial nonattainment areas and those associated with the emerging development of natural resources near PSD (Prevention of Significant Deterioration of Air Quality) Class I areas.

Total Suspended Particulates (TSP) was still the most widespread problem in the Region in 1981. Of the 25 counties exceeding the alert level for any National Ambient Air Quality Standard (NAAQS) pollutant, 24 counties exceeded the TSP alert level. Of the 49 counties in the Region in 1981 having monitoring stations reporting pollutant levels in excess of the primary standard, 31 of those were for TSP exceedances; 6 for O_3 (ozone); 9 for CO (carbon monoxide); 1 for SO_2 (sulfur dioxide); 1 for NO_2 (nitrogen dioxide); and 1 for lead. Figures 1 and 2 illustrate the number of days that the primary standard or alert level was exceeded in 1981 in Region VIII nonattainment areas for CO, O_3, TSP, and SO_2.

Concerning the PSD clean air area problems, there is one area in the Region experiencing PSD Class I SO_2 increment violations and at least three others with the potential for such violations.

B. Colorado

Colorado has six urban/industrial nonattainment areas. Of the six, metropolitan Denver is the most significant problem area in terms of affected geographic area, frequency of alerts and violation days, and magnitude of pollutant levels for TSP, CO, and O_3. The Denver metropolitan area is currently being redesignated as attainment for NO_2, and the Denver metropolitan TSP nonattainment area is expected to be redesignated to include only Denver and portions of Arapahoe and Adams Counties as the nonattainment area. This redesignation will reduce the size of the TSP nonattainment area by two-thirds. The Denver area has received time extensions to meet the CO and O_3 standards, but EPA believes that Colorado's 1982 CO/O_3 SIP has not demonstrated attainment of the CO standard and has proposed to disapprove that portion of the plan.

The Colorado Springs and Grand Junction TSP nonattainment areas are expected to be able to demonstrate attainment by the required statutory deadlines.

Remaining urban problems include the Pueblo TSP, and the Fort Collins, Greeley, and Colorado Springs CO nonattainment areas. Although the most recent TSP monitoring data show that Pueblo is close to meeting the TSP standard, the major industrial emission source in the area (CF&I Steel) was operating at a much reduced capacity during this time. EPA is currently in the process of analyzing available data to determine whether the recent improvements in air quality should be attributed to implementation of the SIP, or to the economic slow-down at CF&I. The Fort Collins, Greeley, and Colorado Springs CO nonattainment areas have received time extensions to meet the CO standards and EPA has proposed to approve those portions of Colorado's 1982 CO/O_3 SIP which deal with these areas.

Since 1982, the recession has temporarily slowed down development of natural resources in western Colorado, an area known for its clean air and potential growth problems. Several oil shale firms have recently submitted new applications for scaled down projects. Anticipated air quality and air quality related value impacts on the Class I areas should be less under this reduced level of development.

Several mountain communities, such as Aspen, Steamboat Springs, and Vail, as well as many other areas in the State, have experienced violations of the annual and 24-hour particulate NAAQS. The problems are caused by rural fugitive dust or by non-conventional sources such as street sanding and fireplace/wood stove emissions. CO may also be a problem in these communities.

C. Montana

CO, TSP, and lead are the pollutants of most concern in Montana. Three cities in Montana (Billings, Great Falls, and Missoula) have failed to submit an adequate SIP to demonstrate compliance with the CO standard, and one TSP nonattainment area (Missoula) will not be in compliance with the particulate standard. Five other nonattainment areas (Great Falls (TSP), Colstrip (TSP), Butte (TSP), East Helena (SO_2) and Laural (SO_2)) are expected to demonstrate that attainment was reached by the end of 1982.

The East Helena area of Montana is experiencing violations of the lead national ambient air quality standard. Submittal of an attainment plan is expected in the Spring of 1983.

D. North Dakota

North Dakota has no nonattainment areas. A very significant air quality management problem in the State, however, has been the predicted consumption of the PSD Management Class I SO_2 increment at the Theodore Roosevelt National Parks. Five State PSD permits have been issued, however. Because Class I SO_2 exceedances were predicted in the five cases reviewed by the State, the companies applied to the Federal Land Manager for a certificate of no adverse impact (pursuant to Section 165(d)(2)(C)(iii) of the Clean Air Act). The National Park Service determined that no adverse impact on the Park's air quality related values would result from the new sources' emissions and issued certificates. This determination allowed the State of North Dakota to issue permits to construct for five sources in question.

North Dakota, with the help of an EPA Region VIII grant, will study the feasibility of an emissions trading program as a means of managing further industrial growth and air quality deterioration in the vicinity of the Theodore Roosevelt National Parks.

E. South Dakota

The only nonattainment area in South Dakota is the TSP nonattainment area in Rapid City. The State and EPA expect to be able to document that attainment was achieved at the end of 1982.

F. Utah

The Wasatch Front (Salt Lake, Weber, Davis, Utah, and Tooele Counties) is the area in Utah with the most significant air pollution problems. One or more of the counties are nonattainment for CO, O_3, TSP, and SO_2. Salt Lake, Davis, Weber, and Utah Counties have received time extensions to meet the CO and/or O_3 standards. However, Region VIII believes that Utah's 1982 CO/O_3 SIP met all Clean Air Act requirements with respect to the attainment of the CO standard in Salt Lake County and the O_3 standard in Salt Lake and Davis Counties, and has proposed to disapprove the SIPs. Specifically, the SIP did not contain adequate commitments to implement the required inspection/maintenance program.

Portions of Salt Lake and Toole County near the Kennecott Copper Smelter are nonattainment for SO_2. Recent data suggests that the area of nonattainment has been narrowed to above 5600 feet in elevation and on Kennecott property.

Region VIII expects Davis County to be able to document attainment of the CO standard by 1982 and Salt Lake, Utah, and Weber Counties to document attainment of the TSP standard by 1982.

Iron County has demonstrated attainment for SO_2 by 1982, and the State has submitted a request for redesignation to EPA.

Utah, like Colorado has significant national resources which are being developed in PSD clean air areas. Development of power plants, shale oil conversion plants and synfuel facilities may create Class I area air quality and air quality related value (i.e., visibility and acid deposition) problems in the future.

G. Wyoming

Sweetwater County, the State's only nonattainment area (for TSP), is believed to have achieved attainment by the end of 1982. Air quality impacts in the mining areas of Campbell and Converse Counties and new natural gas field development in Sublette and Lincoln Counties are of concern because of potential violations of PSD increments and National Ambient Air Quality Standards (NAAQS).

Part II:

A. Discussion of Significant Environmental Problems and Implications for Agency Management.

1. Carbon Monoxide

The CO problems in Colorado (Metro-Denver, Fort Collins, Greeley, and Colorado Springs), Utah (Salt Lake City), and Montana (Missoula, Billings, and Great Falls) are caused by mobile sources. Wood stoves in Missoula are another significant source of CO.

The principal barrier to achievement of the CO standard is the lack of enough effective and enforceable transportation control strategies that have acceptable costs and do not entail severe social impacts.

Region VIII requests assistance in the following areas:

a. More data are needed in general to better characterize and project future emissions of mobile source pollutants at high altitude, particularly light duty diesel vehicles and heavy duty gas and diesel vehicles.

b. A research program to investigate emissions from vehicles using gasohol as fuel.

c. Long term support for the State of Colorado's new Denver vehicle emissions testing laboratory which is the only facility EPA and the State now can reliably access.

d. A research program to investigate CO emissions from wood stoves and CO control techniques for such appliances.

Region VIII plans to disapprove the CO portions of the 1982 Denver and Salt Lake City Attainment Plans because Denver's Episodic Share-a-ride strategy is unenforceable, not adequately documented, and unrealistic; while Salt Lake City's Plan did not contain adequate commitments to implement the required I/M program. The Montana CO problems are less serious than those in Denver and Salt Lake and will be mitigated by the imposition of traffic management strategies. CO emissions from wood stoves will continue to be a problem. Region VIII will continue to work with these States to develop acceptable strategies.

2. TSP

The TSP problems in the Region are generally caused by auto and truck exhaust, power plants, smelters, steel plants, fireplaces, wood stoves, street cleaning, winter sanding, unpaved roads, construction work, demolition activities, unpaved alleys, and parking areas. Fugitive dust emissions from surface mines are also significant in some areas. Although not directly related to TSP, visibility reductions due to fine particles is also a problem in urban areas.

The principal barriers to achievement of the TSP standard are:

a. The difficulty and the cost of controlling the nontraditional sources, such as fireplaces, wood stoves, street cleaning, sanding, construction work, etc.

b. The dry, windy conditions typical in Region VIII which encourage the reentrainment of fugitive dust.

c. The uncertainties resulting from the proposed change to an inhalable particulate standard.

Region VIII requests assistance in the following areas:

a. Additional research funds directed toward the investigation of urban haze. The expedited completion of the 1982 Denver Winter Haze Study. A TSP characterization study for Sale Lake City.

b. Additional research studies on emissions and control strategies for residential combustion of wood and coal.

c. A decision on the proposed inhalable particulate standard and quick promulgation thereafter.

d. Promulgation of exhaust emission standards for diesels.

e. Research to determine the current and future contributiuon of diesels to the particulate loading and visibility reduction problems, and the contribution of diesels to the atmospheric loading of pollutants other than the NAAQS pollutants.

3. Ozone

The metropolitan Denver and Salt Lake City areas are the only two areas in Region VIII that are nonattainment for ozone. The ozone problem is predominately caused by motor vehicle emissions, e.g., in Denver about 80% of the VOC and 30% of the NO_x emissions are from mobile sources.

EPA Region VIII expects both Denver and Salt Lake City to be able to meet the ozone standard by 1987.

4. Lead

The ASARCO lead smelter in East Helena, Montana is causing violations of the lead NAAQS. The principal barriers to achievement of the lead standard is the cost of cleaning up the causes of the problem. Lead is emitted from point sources, fugitive smelter sources, and also reentrained from streets and soil from areas that have been contaminated for years.

The State of Montana plans to submit a SIP revision for attainment of the lead standard in the spring of 1983.

Region VIII requests assistance in the following areas:

a. Evaluation of the contributions of individual sources to the lead pollution problem.

b. Identification of control technologies for individual sources which contribute to the lead pollution problem.

c. Control techniques for lead smelter emissions of air toxics such as cadmium and arsenic.

5. Acid Deposition and Other Air Pollution Effects on the Air Quality Related Values of Class I Areas.

The Federal Land Managers of Class I areas have been given the affirmative responsibility by the Clean Air Act to protect the air quality related values of the lands they manage. Air quality related values (AQRV) include visibility, flora, and fauna, soils, and water. The PSD regulations require the impacts of PSD sources emissions on a Class I area's AQRV to be investigated and quantified. If a proposed PSD source will cause adverse impacts on the AQRV of a Class I area, the PSD permit can be denied.

Presently, AQRV are of particular concern for the Colorado Flat Tops and Mt. Zirkel Wilderness areas and the North Dakota Theodore Roosevelt National Park. The former area may be adversely affected by large scale development of oil shale reserves. New power plants, synfuel plants, and oil and gas fields are threatening the AQRV of the latter park. Acid deposition may already be a problem in the high altitude lakes in Colorado. These high altitude lakes are extremely sensitive to changes caused by acid deposition. Two limited Colorado studies suggest that several lakes have already been affected by acid deposition caused by SO_2 and NO_2 emissions. Regional visibility impairment in Flat Tops Wilderness and Colorado's western slope may also result from large scale industrial development.

The principal barrier to the adequate analysis of the effects of acid deposition and other air pollutants on AQRV are:

a. The lack of adequate predictive modeling tools that attempt to quantify the source receptor relationships between acid deposition and other pollutants, and AQRV.

b. The lack of adequate data to define baseline conditions for various air quality related values, such as the baseline conditions of high altitude lakes in the Flat Tops Wilderness.

Region VIII requests assistance in the following areas:

a. Research funds directed toward meeting the goal of developing a predictive model to estimate acid deposition effects and other significant air pollution effects on AQRV of selected Class I areas in Region VIII.

b. Research funds to provide for the collection of data that define baseline conditions for significant AQRV in selected Class I areas in Region VIII.

B. Ranking of Region VIII's Air Quality Problems

Region VIII has ranked the air quality problems into first and second level priority groups.

The air quality problems assigned to the first level or highest priority group are the Region's CO, TSP, and lead problems. These problems were placed on the first level because all three pollutants adversely affect human health in those geographic areas where the ambient concentrations exceed the National Ambient Air Quality Standards. The CO and TSP problem areas may continue to be problem areas well beyond the statutory deadlines for attaining the pollutant standards. The East Helena lead problem may also continue to be a problem for some time because of the various barriers discussed above in Part II.A.

The second level priority group includes the ozone and acid deposition problems. Ozone concentrations are in excess of the NAAQS in Denver and Salt Lake and thus pose a threat to human health. However, indications are that by 1987, ozone will cease to be a major air pollution problem in Region VIII and for this reason ozone was placed in the second category. Acid deposition and other effects on air quality related values of Class I areas will become increasingly more important in the mid to long-term. In the short-term, in the absence of significant adverse impacts, it is necessary to define current baseline conditions, develop predictive models that quantify the cause/effect relationships between increased industrial emissions and impacts on AQRVs, and develop reference methods for monitoring air quality related values, such as acid deposition and visibility.

C. List of Emerging Problems in Region VIII

1. Acid Deposition

This is discussed in Part II.A.5.

2. Emissions from Diesel Vehicles

Preliminary results from a study conducted by the Colorado Department of Health indicate that the projected increase in numbers of diesel cars and light duty trucks by the year 2000 would have serious impacts on Colorado's air quality and possible implications for public health. Diesel particulates and some hydrocarbons in diesel emissions contain carcinogenic materials, and may affect lung clearance mechanisms, damage lung tissue, and adversely affect pulmonary defense mechanisms. Although the Colorado Health Department has indicated the most interest in this issue so far, the impacts of diesel emissions would be felt in the larger metropolitan areas across the Region and the nation. More research needs to be done on these potential health impacts.

3. Organic Compound Emissions from Wood Stoves and Fireplaces

Woodburning appliances may produce potentially hazardous emissions of pollutants other than those for which a National Ambient Air Quality Standard exists. More research is needed to characterize the wood stove emissions and to document the effect of exposure to these emissions.

4. Indoor Air Pollution.

To combat rising heating costs, homeowners are turning to superinsulation, space heaters, and other alternative heating technologies. As a result, there is growing concern about the public health effects of indoor air pollutants such as carbon monoxide and formaldehyde. More information is needed on the chronic effects of exposures to these pollutants.

5. Availability of Complex Terrain and Long Range Transport and Diffusion Models.

Research must continue on the development and validation of models that predict air quality concentrations in the vicinity of complex terrain and also at receptors much greater than 50 km from an emissions source. Such models would be used routinely in PSD permit modeling analyzes in Colorado, Montana, North Dakota, and Utah.

6. Cadmium and Arsenic Levels in East Helena.

This emerging problem is referred above in Part II.A.4.

7. Potential Air Quality Problems on Indian Reservations within Region VIII.

Indian tribes in Region VIII are generally very interested in preserving their excellent air quality. The Northern Cheyennes (MT) and Flathead Indians (MT) have already redesignated their reservations to PSD Class I. Development of energy resources near the reservations may create Class I or Class II PSD increment violations on the reservations. Other reservations, such as the Crow Indian Reservation are interested in developing their mineral resources. Such development can produce air quality problems on their reservation as well as on neighboring lands. Presently, EPA grants are being used by Indian tribes for baseline data collection, regulation, development, and PSD area redesignation studies.

ATTACHMENT A

III. AIR QUALITY OVERVIEW

Region VIII air quality problems can be categorized into two classes: those associated with the urban/industrial nonattainment areas and those associated with the emerging development of natural resources in clean air PSD areas. This air quality section will address the significant air quality problems within specific geographic areas in each of the Region VIII states. Figures 3 through 9 present Region VIII maps illustrating those 1981 sites where monitoring data was collected and those sites which experienced exceedances of alert levels and ambient standards for the pollutants TSP, CO, O_3, SO_2, NO_2, and lead. The maps also locate those existing and potential PSD problem areas.

A. Colorado

Colorado has six nonattainment areas in urban/industrial areas: Metropolitan Denver, Fort Collins, Greeley, Colorado Springs, Pueblo, and Grand Junction. Of this six, the Denver metropolitan area is the most significant problem area in terms of affected geographic area, frequency of alerts, and violation days, and magnitude of pollutant levels for TSP, CO, O_3, and NO_2.

1. Denver

Figure 10 and Tables 1 and 2 illustrate the metro Denver monitoring sites and locations where the exceedances of NAAQS pollutant standards and alert levels were observed.

NO_2 levels in Denver have been declining over the past five years (1977-1981). The State of Colorado has submitted a request to redesignate the metro-Denver area from nonattainment to attainment for NO_2. On February 15, 1983, EPA proposed to approve the redesignation to attainment.

The 1981 average of the annual TSP geometric means for all TSP stations in Denver was the lowest average in five years. The year 1981 had the fewest number of TSP alert days (11) and TSP primary standard violation days (39) in the past three years (1981-1979 data). The number of TSP alert days and primary violation days for Denver in 1979 was 27 and 51 respectively. Current data suggests that the Boulder, Douglas, and Jefferson Counties portion of the metro-Denver TSP nonattainment area will be able to document compliance with TSP standards. This effectively reduces the size of the metropolitan Denver TSP nonattainment area by two-thirds. (Denver and portions of Adams and Arapahoe counties would then constitute the TSP nonattainment area.) The Denver TSP emissions come from power plants, fireplaces, mobile sources, street cleaning and sanding, demolition and construction activities, and parking areas.

The number of days in violation of the ozone standard in both 1981 and 1980 in Denver was three. The corresponding numbers for 1979, 1978, and 1977 were 12, 5, and 15. There was only one instance of the ozone alert level being reached in the years 1977-1981. This occurred in 1978. The highest second maximum values occurred at different stations each year. However, the data do indicate improvement. The worst case of ozone violations in 1978 were 43% over the standard, compared to 7% and 14% in 1980 and 1981 respectively. VOC and NO_2 emissions from mobile and stationary sources produce the high ozone levels. Federal exhaust emission standards, the State I/M program, and VOC regulations for stationary sources provide the necessary reductions to reasonably predict attainment by 1987. Denver has received an ozone attainment deadline extension until 1987. Region VIII has proposed to approve the 1982 Denver ozone SIP because attainment is expected by 1987.

CO is and will continue to be a serious air pollution problem in Denver for some time to come. Highest second maximum 1981 CO levels in Denver were as great or greater than the 1980 levels for both the 1 and 8 hour CO averages at nearly every one of the Denver CO stations. The number of days during which the 1 and 8 hour CO standards were exceeded in 1981 were greater than the number of days in 1980. However, the number of violation days in 1981 was approximately one-half the number of violation days in either 1978 or 1979. In 1981, the second highest 1-hour CO concentration was 57% over the CO standard, while the second highest 8-hour CO concentration was 209% over the CO standard. The comparable figures for 1980 were 18% and 137%; and for 1979, 29% and 173% respectively. Mobile sources are the major source of CO emissions in Denver. In 1978, CO emissions from mobile sources accounted for 94% of the total Denver CO emissions.

Region VIII has proposed to disapprove the Denver CO SIP because it failed to demonstrate attainment of the CO standard by 1987. The CO plan relied on a voluntary episodic share-a-ride strategy that was unenforceable and, in conjunction with other strategies, would not provide the necessary CO emission reductions to achieve compliance by 1987. The State of Colorado faces the difficult task of finding other economically viable, socially acceptable, enforceable strategies that will produce the needed CO emission reductions. Without additional strategies, CO attainment may not be achieved until the early 1990's. The State of Colorado's position is that the episodic share-a-ride strategy is a viable strategy, that, if followed, would show attainment of the CO standard by 1987.

2. Fort Collins and Greeley

The Fort Collins and Greeley areas are nonattainment for CO. Region VIII has proposed to approve their CO SIP's because they acceptably demonstrate attainment by 1987. The CO problems in both cities are localized and infrequent and generally associated with meteorological inversion conditions in the winter. The major source of CO emissions are mobile sources. No violations of the 1-hour standard have been recorded. In the years 1979-1981, Fort Collins has experienced 9-19 violation of the 8-hour standard per year; while Greeley has experienced 8-10 violations per year.

Both cities had 1981 second maximum 8-hour CO concentrations in excess of the standards by about 30%. The 1987 attainment of the CO standard will be achieved by the Federal Motor Vehicle Control Program, traffic flow improvements, and in the case of Fort Collins, an I/M program.

3. Colorado Springs

The Colorado Springs area is nonattainment for CO and TSP. Region VIII has proposed to approve the CO SIP because attainment is demonstrated by 1987 with the Federal Motor Vehicle Control Program, an I/M program, traffic flow improvements and improved mass transit. The 1-hour CO standard has only been violated once in the Springs since 1979. The number of violations of the 8-hour CO standard have been declining since 1979. The year 1981 produced the fewest CO violations (4) in the past three years.

The Colorado Springs TSP data indicate no violations of the TSP primary standards in 1981. The violations observed in the years 1977-1980 have been of the annual TSP standard. There have been no violations of the 24-hour TSP primary standard since 1977. This area is expected to be able to document attainment of the TSP standard by 1982 once the 1982 air quality data are analyzed.

4. Grand Junction

The Grand Junction area, a TSP nonattainment area, is expected to be able to document attainment of the TSP standards by 1982, once the 1982 data is analyzed. The 1981 annual TSP levels were about 5% above the 75 ug/m^3 TSP standard.

5. Pueblo

The Pueblo TSP nonattainment area's major industrial TSP source is an integrated iron and steel plant. The violations of the TSP standards are primarily those of the annual standard rather than the 24-hour standard. The 1981 and January to June 1982 TSP data indicate significantly lower TSP levels than those recorded in the preceeding four years 1977-1980. EPA is currently reviewing data to assess whether or not the ambient improvement should be attributed to the fact that the steel plant operated at a much reduced capacity during this time period. Region VIII conditionally approved the 1979 Pueblo TSP SIP requiring an attainment demonstration of the annual and 24-hour standards and Reasonably Available Control Technology (RACT) controls. In December 1982, EPA Region VIII received a complete revision to the RACT portion of the SIP which require controls to be applied beginning in 1984. We are presently reviewing this SIP revision. Promulgation of an inhalable particulate (IP) standard may change the area's status to attainment and negate the need for further RACT controls.

6. Western Colorado

A potential long term emerging problem may be the large scale development of oil shale resources in Garfield and Rio Blanco Counties in western Colorado. EPA Region VIII has permitted five oil shale projects with a combined production of 63,000 barrels per day of shale oil. Presently, Region VIII has three additional projects under PSD review that, if permitted, will provide an additional 192,000 barrels per day of shale oil. Projects in the proposal stage could ultimately boost shale oil production in these two Colorado counties to 750,000 barrels per day. The major air quality issues are the consumption of the Class I SO_2 increment in Flat Tops Wilderness (Class I area), acid deposition and other air quality related values impacts on Flat Tops, and the air quality impact associated with large scale industrial growth and population influx in a predominately rural area.

The recession has slowed down plans for oil shale development in 1982. However, interest in oil shale development in the west has always been cyclical, and there is some indication that energy companies are once again willing to proceed with oil shale development albeit at a reduced level.

Several mountain communities, such as Aspen, Steamboat Springs, and Vail, as well as many other areas in the State have experienced violations of the annual and 24-hour particulate NAAQS. The problems are caused by rural fugitive dust or by non-conventional sources such as street sanding and fireplace/wood stove emissions. CO may also be a problem in these communities.

B. Montana

Montana has eight nonattainment areas for TSP, SO_2, CO, and lead: Billings (SO_2 and CO); Butte (TSP); Colstrip (TSP); Columbia Falls (TSP); East Helena (SO_2 and lead); Great Falls (CO); Laurel (SO_2), and Missoula (TSP, and CO).

Billings CO emissions stem mainly from mobile sources and wood-fired home heating devices. The CO problem in Billings is very localized. The Federal Motor Vehicle Control Program and reconstruction of a roadway intersection to improve traffic flow were the strategies used to show attainment of the CO standard by 1982. However, the roadway reconstruction was delayed and statutory requirements prevented EPA from granting Billings a CO extension until 1983 because the time for application for the CO/O_3 extension had passed. EPA Region VIII will approve the reconstruction as a control measure, but must disapprove the schedule showing compliance after 1982. In 1981, there were no violations of the 1 or 8-hour CO standard in Billings.

Based on SO_2 data the State is currently gathering in Billings, it is anticipated that there will be violations of the SO_2 NAAQS in that community. If this persists, the State may have to designate Billings as a nonattainment area for SO_2.

The State of Montana will redesignate the Butte TSP nonattainment area to attainment. The major cause of the TSP problem, an open pit copper mine, has been shut down and its State air permit rescinded.

The Colstrip TSP nonattainment area is expected to be able to demonstrate attainment once the 1982 data is analyzed. This area has numerous large surface coal mines. The State of Montana has been permitting surface mines and requiring strict fugitive dust controls.

The Columbia Falls TSP area is expected to be able to demonstrate attainment once the 1982 data is analyzed. The TSP problem is caused primarily by fugitive dust. The State is expected to redesignate this area to attainment.

The East Helena nonattainment area's SO_2 and lead problems are caused by a lead smelter. The SO_2 area will be redesignated to attainment because the double contact acid plant control technology the smelter has employed has drastically reduced SO_2 emissions. However, this area is not meeting the lead national ambient air quality standard. Lead is emitted from point sources, fugitive sources and also reentrained from streets and soils that have been contaminated for years. The State of Montana has analyzed the problem and plans to submit in the spring of 1983 a plan to show attainment of the lead standard. The annual concentrations of cadmium and arsenic are the highest in the State of Montana.

The CO problem in Great Falls is generally localized and caused by motor vehicle emissions, wood stove emissions, and unique meteorological conditions. However, there is no approved CO SIP for Great Falls. The State plans to submit a CO SIP for Great Falls in the spring of 1983.

Laurel SO_2 emissions come primarily from an oil refinery. Stationary source controls on the refinery has reduced SO_2 emissions and it is believed that attainment may have been achieved. This will be verified with the 1982 and 1983 data.

The Missoula area is not expected to demonstrate that attainment of the CO and TSP standard was achieved at the end of 1982. The Missoula TSP problem is probably the most significant TSP problem in the State. The topography, meteorology, Kraft paper mill emissions, and the large number of wood burning stoves and fireplaces produce this problem. EPA Region VIII had approved the TSP SIP but attainment has not been achieved and will not be for several years to come. Organic compound emissions from stoves and fireplaces may well pose a new health hazard to Missoula residents. Missoula appears to have an area wide CO problem as a result of the rapid proliferation of wood stoves. The city was originally designated nonattainment of CO on the basis of CO data collected near a problem intersection. That problem is being addressed through the redesign and reconstruction of the intersection. However, the construction phase of the project will not be completed until 1985. EPA was forced to deny Missoula's request for a CO deadline extension beyond 1982 because the extension application was submitted too late.

C. North Dakota

North Dakota is in attainment of the primary TSP, SO_2, NO_2, O_3, and lead national ambient air quality standards.[3] There are no nonattainment areas in the State.

The State of North Dakota has operated the Prevention of Significant Deterioration (PSD) air program since May of 1977. North Dakota has large reserves of coal, oil, and natural gas located in the west central part of the State, commonly referred to as the Williston Basin. Located near the areas of existing and potential resource development are the Theodore Roosevelt National Park (TRNP) and the Lostwood National Wilderness Area (LWNA), both of which are classified as Class I areas under the Clean Air Act. Several facilities have been constructed in western North Dakota which were not subject to PSD requirements at the time. These existing facilities generally did not employ best technology for reducing emissions of sulfur dioxide. Between the time that the North Dakota PSD program was initiated and early 1980, a total of ten PSD increment consuming facilities were permitted in western North Dakota and in extreme eastern Montana. These facilities, which includes the nation's first coal gasification plant at Beulah, North Dakota, were predicted to consume the entire sulfur dioxide 24-hour Class I increment at the TRNP based on the use of the approved EPA atmospheric dispersion models.

Since early 1980, six additional western North Dakota potential sources, including two power plants, one coal gasification plant, and three natural gas desulfurization plants have applied for PSD permits. The investment for these planned facilities totals approximately 5.6 billion dollars. Five of these facilities have since received PSD permits.

More sophisticated and appropriate atmospheric dispersion models than those previously used were proposed for regulatory approval and use by the North Dakota State Department of Health and several of the six new PSD permit applicants. After much research and public comment, the Department of Health chose and modified a mesoscale atmospheric dispersion model to predict air quality impacts within 250 km of an air pollution source.

The State model showed that the Class I SO_2 short-term increments would be exceeded at TRNP with operation of only the ten PSD sources permitted prior to early 1980. The model showed that the number and magnitude of exceedances of the Class I SO_2 short-term increments would be increased if five of the six proposed facilities were built. A sixth facility was shown not to contribute significantly to any exceedances of the Class I increment, and it thus received a PSD permit. The other five facilities have applied for and received a certification of "no adverse impact" on air quality related values at TRNP and LNWA from the Department of the Interior (DOI). The State has subsequently issued PSD permits for four of these five facilities. The remaining facility is still undergoing State review for concerns other than Class I impact. EPA Region VIII has approved the State of North Dakota's use of nonguideline model (Mesopuff) on a case-by-case basis in these recent PSD new source reviews.

In March of 1983, EPA Region VIII awarded a grant to the North Dakota State Department of Health for the purpose of studying the feasibility of establishing an emissions trading program in the western half of the State. While present projected ambient levels of air pollutants in North Dakota are not anticipated to have an adverse impact on the air quality related values of the Class I areas (and western North Dakota in general), it is believed that the existing air resource is finite and the atmospheric loading of particulates and SO_2 can reach adverse levels in the future. Several older coal-fired and other facilities are operating without modern control equipment for SO_2 and particulates. These facilities were constructed and began operating prior to the present regulatory emission limitations and control device effeciencies. It appears that retrofitting these sources with modern control equipment can reduce atmospheric loading and may provide offsets and room for growth for new facilities. The State expects to have an operational program by 1985.

D. South Dakota

Rapid City is a TSP nonattainment area and is the only nonattainment area in South Dakota. EPA Region VIII has recently funded two studies for this area to better understand the problem. The first effort was an emission inventory for all TSP sources. The draft report shows that only 35% of the emissions are from point sources with the other 65% from area sources and fugitive emissions. As of December 31, 1982, only one main point source is considered to be out of compliance - the State Cement Plant. The State Cement Plant has a plan to bring their facility into compliance by April 1983 and is the subject of EPA enforcement action to prevent the plant from operating the violating sources until controls are installed. The second task was to compile all the meteorological and TSP data collected and perform statistical tests to help estimate the ambient impact of the traditional versus nontraditional sources. The Rapid City area currently has an approved TSP SIP which demonstrates attainment by the end of 1982.

EPA Region VIII now believes that Rapid City is close to attaining the TSP standard and will have to wait for a couple of quarters of 1983 data before concluding that the area has or has not attained. The State is in the process of determining if all of the SIP requirements for attainment have been completed.

E. Utah

Utah has six areas designated as nonattainment for one or more pollutants: Salt Lake City and County (CO, O_3, SO_2, TSP); Ogden (CO and TSP); Cedar City (SO_2); and Toole County (SO_2). Violations of the lead standard have also been recorded in Salt Lake County. Figure 11 and Table 3 illustrate the location of monitoring stations in the Wasatch Front and those sites reporting exceedances of pollutant standards and alert levels.

Salt Lake City and County is designated nonattainment for CO, O_3, SO_2, and TSP. There were no violations of the 1-hour CO standard in Salt Lake; however, there were 12, 10, and 4 violations of the 8-hour CO standard in 1979, 1980, and 1981 respectively. The second high 8-hour CO concentrations for the years 1979, 1980, and 1981 were 16, 15, and 10 ppm respectively. The CO problem in Salt Lake is caused by emissions of mobile sources. Ninety percent of annual CO emissions in Salt Lake County come from vehicles. The State has proposed three strategies to show attainment by 1987: The Federal Motor Vehicle Control Program, an I/M program for Salt Lake and Davis Counties, and selected traffic control measures. The Salt Lake CO SIP demonstrates attainment by May 1984 with I/M, and August 1985 without I/M. EPA Region VIII has proposed to disapprove the CO SIP because the I/M program requirements of the Clean Air Act were not met with regard to documenting specific proceedures for effective enforcement of the I/M program, along with rules, ordinances, or other documentation illustrating a commitment to enforce. This disapproval is controversial because Utah can easily demonstrate attainment of the CO (and ozone) standards before 1987 without an I/M program in place. If the State Air Quality projections are accurate and Utah was to move ahead with the I/M program, it is possible that the program would become mandatory at approximately the same time the standards are projected to be achieved.

During 1981, the National Ambient Air Quality Standard for ozone was exceeded on thirteen separate days in Salt Lake and Davis Counties. In 1980 and 1979 the number of violation days were 12 and 11. The peak 1-hour ozone values observed in Salt Lake and Davis Counties in 1981, 1980, and 1979 were 0.163, 0.182, and 0.190 ppm, respectively. The causes of the ozone problem are the mobile and stationary source emissions of VOC and NO_x. In 1980, mobile sources contributed 56% of the VOC and 61% of the NO_x emissions in Salt Lake and Davis Counties. Stationary sources contributed about 40% of the VOC and 30% of the NO_x emissions in the same area.

Four strategies were adopted in the Salt Lake and Davis County ozone SIP: The Federal Motor Vehicle Control Program, an I/M program, transportation control measures and RACT emission controls on all major VOC Stationary Sources in the area. The State has demonstrated attainment of the ozone Standard in Salt Lake and Davic Counties by December 1, 1983.Attainment has also been demonstrated by July 1, 1984, without an I/M program. EPA Region VIII has proposed to disapprove the Salt Lake-Davis County ozone SIP because the I/M program requirements of the Clean Air Act were not met with respect to documenting specific procedures for enforcement of the I/M program, along with rules, ordinances, or other documentation illustrating a commitment to enforce. As with the CO attainment demonstration, it is possible that the O_3 standard may be achieved at the time a mandatory I/M program would become operational.

With respect to SO_2, the State has requested in March 1983 to redesignate Salt Lake County to attainment status. EPA is reviewing the Utah SIP which was developed for the areas around the Kennecott Copper Smelter. The State's plan includes control requirements for the low level sources as well as a multipoint limit for the main stack. The emission sources controlled by the plan are the power plant boilers, the molybdenite heat treaters, the refinery, fugitive emissions, and the main stack. The boilers, treaters, and refinery are required to meet constant emission limitations. Fugitive emissions are controlled by "best engineering techniques." The main stack, which accounts for 88% of the total emissions, is controlled by a variable emission limitation developed using the multipoint rollback approach and represents about an 89% control of SO_2 emissions. The plan appears to be adequate to attain the standards in the lower elevations (below 5600 ft), but will not attain the standards for a large area above 5600 feet that is owned by Kennecott. The Region has proposed approval based upon the determination that the air above company property is not "ambient air." That decision is being scrutinized in Headquarters.

Salt Lake County does not presently have an approved TSP SIP. The Kennecott Copper Smelter does not presently have an enforceable TSP RACT regulation because of the lack of an in-stack test method that is equivalent to Reference Method 5. EPA Region VIII expects that the enforceability issues will be resolved during 1983 and would thus correct the SIP deficiency for TSP in portions of Salt Lake County. The State requested redesignation of Salt Lake County to attainment for TSP in March 1983.

Davis County is nonattainment for CO and O_3. Davis County is expected to be able to demonstrate compliance with the CO standard after the 1982 year data is analyzed. On October 28, 1982, the State requested Davis County be redesignated as attainment for CO. There were no CO primary standard violations in Davis County in 1981. The Davis County O_3 problem was discussed with the Salt Lake County O_3 problem above.

Provo and Utah County are nonattainment areas for CO and TSP. In 1980, 14 8-hour periods were in excess of the CO standard. Five 8-hour periods were recorded in excess of CO standard in 1981. The second highest 8-hour CO concentrations in 1980 and 1981 were 14 and 12 ppm respectively. There were no violations of the 1-hour CO standard in those years. Seventy-one percent of CO emissions in Utah County come from mobile sources. In Provo, alone, 83 percent of CO emissions come from mobile sources. Provo is expected to attain the CO standard by February 1, 1986, with the FederalMotor Vehicle Control Program and transportation control measures. I/M is not required because of EPA's policy not to require the program in areas with less than 200,000 population. EPA Region VIII has proposed to approve the Provo CO SIP.

EPA Region VIII believes that Utah County will probably be able to demonstrate compliance with the TSP primary standards once the most recent data are analyzed. The major source of the TSP problem in the County has been the U.S. Steel Geneva Works Plant in Orem, Utah. A 1981 Consent Decree between EPA, the State of Utah, and U.S. Steel prescribed emission limitations, air pollution control devices and operating and maintenance procedures. In 1982, the Decree was formally amended to permit U.S. Steel to use alternative emission controls is at the blast furnace casthouses and for open hearth tapping. This new non-capture suppression technology significantly reduces operating costs and capital. Violations of the open hearth shop low emission practices were documented in September 1982. These violations were resolved through a January 1983 stipulation requiring U.S. Steel to pay a $50,000 penalty and to follow the necessary procedures in the future.

Ogden and Weber County are nonattainment for CO and TSP. The number of 8-hour CO concentrations in excess of the standard in 1979, 1980, and 1981 were 13, 5, and 1, respectively. The second highest 8-hour concentrations in those years were 13, 12, and 10 ppm. Eighty-six percent of CO emissions in Ogden are from mobile sources. The State has proposed the Federal Motor Vehicle Control Program and transportation control measures as strategies to achieve compliance with the CO standard by July 1, 1982. I/M is not a required strategy because Ogden's population is less than 200,000.

The TSP Standard was expected to have been achieved at the end of 1982. The 1981 TSP data from Weber County indicated no annual primary standard violations and only one violation of the 24-hour primary standard. EPA Region VIII has approved Weber County's TSP SIP. The State of Utah requested an attainment designation for Ogden for TSP in March 1983.

The State of Utah has requested that the Cedar City/Iron County SO_2 nonattainment area be redesignated to attainment status. There were no SO_2 violations in the area in 1979 and 1980.

Plans are being made to produce synthetic fuels from oil shale and tar sands deposition in Uinta County, Utah. Presently 148,100 barrels per day of shale oil production have already been permitted in the Uinta Basin with another 140,300 barrels per day of production presently undergoing PSD review. The air quality impacts on Class I and II areas, and potential adverse impacts on air quality related values of these Class I areas are of special concern and may prove to be significant issues in the mid to late 1980's. Air pollution impacts associated with population growth caused by this major industrial growth is also of concern.

F. Wyoming

The Trona (sodium carbonate) industrial area in Sweetwater County is the State's only nonattainment area (for TSP). The State conducted an extensive evaluation of the problem to determine the control measures needed to meet the TSP standards. A plan was developed containing schedules for installation of particulate control technology for the area's three Trona plants. The last piece of required control technology was installed in late 1982. No violations of the primary TSP standards were observed in the years 1977-1981. The State of Wyoming has requested the area be redesignated to attainment.

A potential emerging problem is the development of sour gas fields in Sublette and Lincoln Counties. The Riley Ridge Project envisions the sweetening of nearly three billion cubic feet per day of sour gas. Potential impacts include Class I and Class II PSD increment violations, significant short term concentrations of H_2S and COS (carbonyl sulfide). Acid deposition and other adverse impacts on the air quality related values of nearby Wyoming Class I wilderness areas are possible.

FIGURE I:

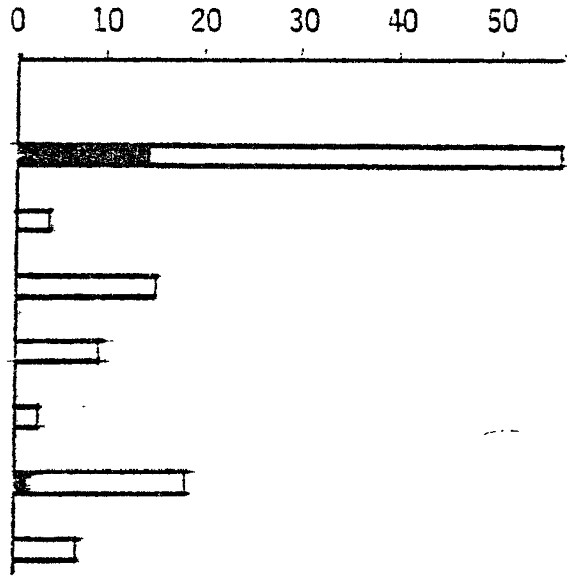
NUMBER OF DAYS THAT PRIMARY STANDARD OR ALERT LEVEL WAS EXCEEDED IN 1981

REGION VIII NONATTAINMENT AREAS

CARBON MONOXIDE

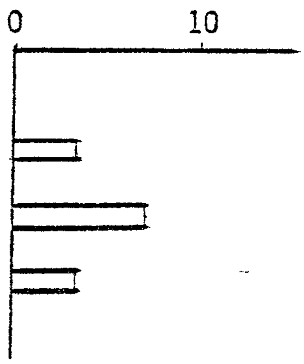
Days/Year

Area	State	Days Sampled
Denver Designated Area	CO	356
Colorado Springs 3C	CO	365
Fort Collins-Greeley	CO	365
City of Missoula	MT	359
City of Ogden	UT	354
City of Provo	UT	321
Salt Lake City	UT	365



OZONE Exceedence Days/Year (1979-1981)

Area	State	Days Sampled
Denver Designated Area	CO	357
Davis County	UT	344
Salt Lake County	UT	363



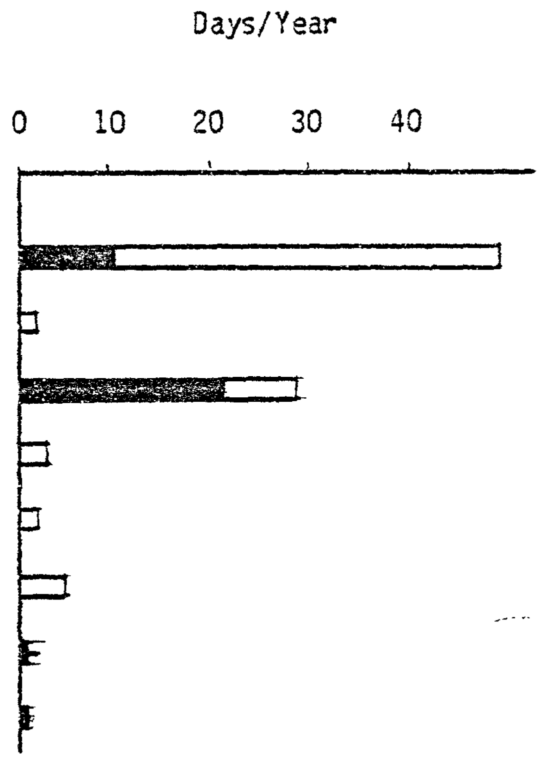
Primary level exceeded

Alert level exceeded

FIGURE 2: NUMBER OF DAYS THAT PRIMARY STANDARD OR ALERT LEVEL WAS EXCEEDED IN 1981

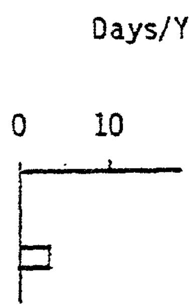
TOTAL SUSPENDED PARTICULATES

Area	State	Days Sampled
Denver Designated Area	CO	194
Fort Collins-Greeley	CO	91
Colstrip Area	MT	124
City of Columbia Falls	MT	41
Great Falls Area	MT	41
Rapid City Area	SD	61
Salt Lake County	UT	365
Utah County	UT	364



SULFUR DIOXIDE

Area	State	Days Sampled
Salt Lake County	UT	365



Primary level exceeded

Alert level exceeded

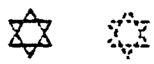
FIGURE 3. SYMBOLS TO BE USED ON STATUS MAPS

Basic Symbols for Showing Site Locations and Ambient Standards Exceedances


Site with no ambient standards exceeded

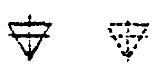

Site exceeding the short-term primary standard (e.g., 24-hour SO_2, or 1-hour CO)

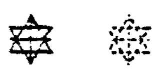

Site exceeding the long-term primary standard (e.g., annual TSP, or 8-hour CO)


Site exceeding long-term and short-term primary standards


Site exceeding only a secondary standard

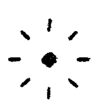

Site exceeding the short-term primary standards and the secondary standard


Site exceeding the long-term primary standard and the secondary standard

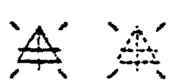

Site exceeding long-term and short-term primary standards, and the secondary standard

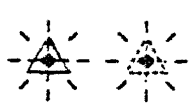
Additional Symbols for Showing Alert and Warning Level Exceedances

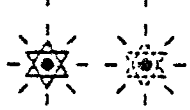

Alert level exceeded at this site

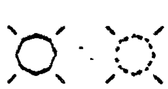

Warning level exceeded at this site

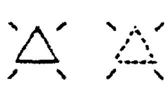
Examples of Composite Symbols


Site exceeding short-term primary standard, secondard standard, and alert level


Site exceeding short-term primary standard, secondary standard, alert level, and warning level


Site exceeding short-term and long-term primary standards, alert level, and warning level


Site exceeding only the alert level, but no ambient standards


Site exceeding short-term primary standard and alert level

Dashed symbols indicate sites that did not report enough data to meet NADB criteria for representativeness.

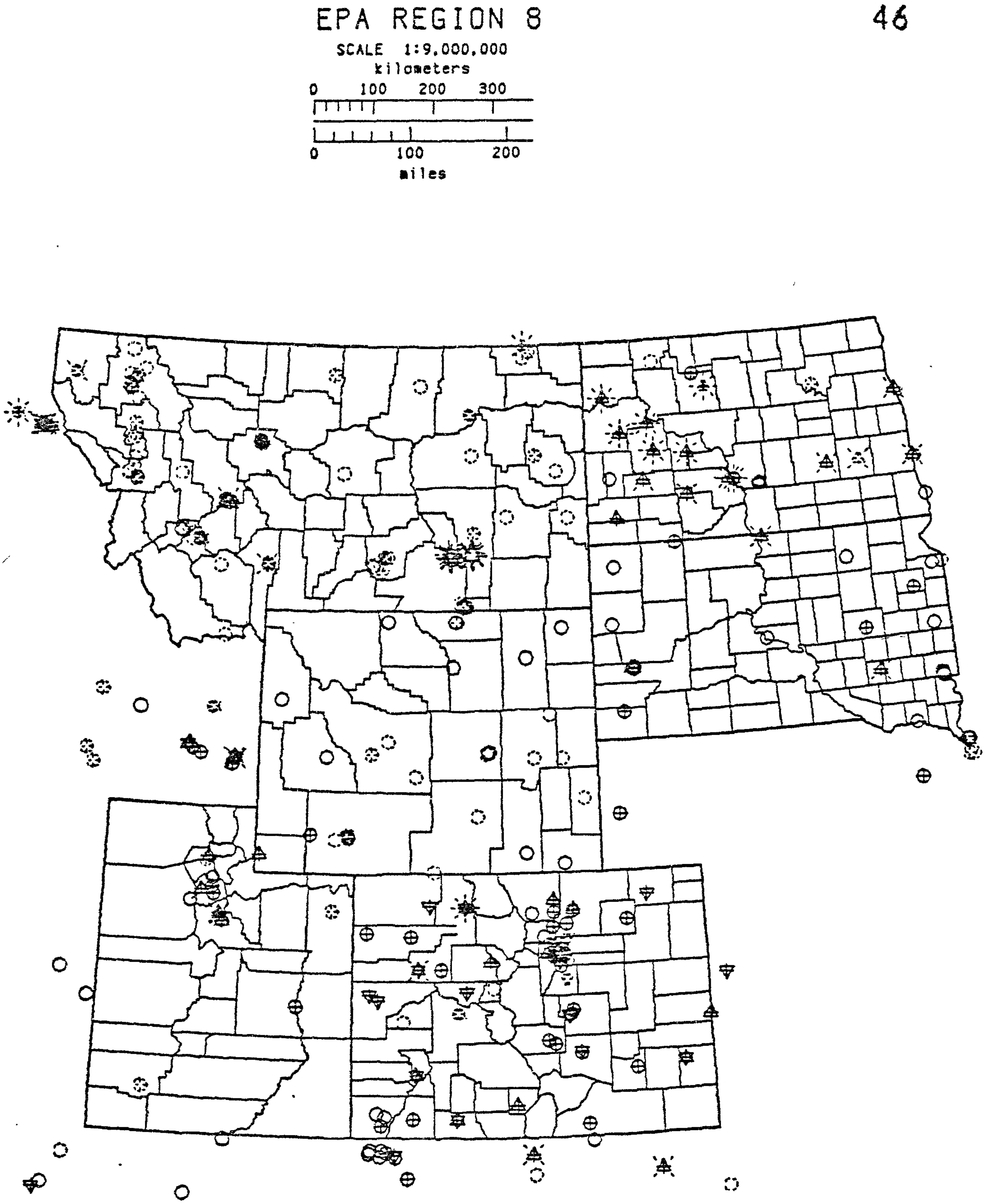


FIGURE 4. Alerts and Standards Map for TSP -- 1981

EPA REGION 8

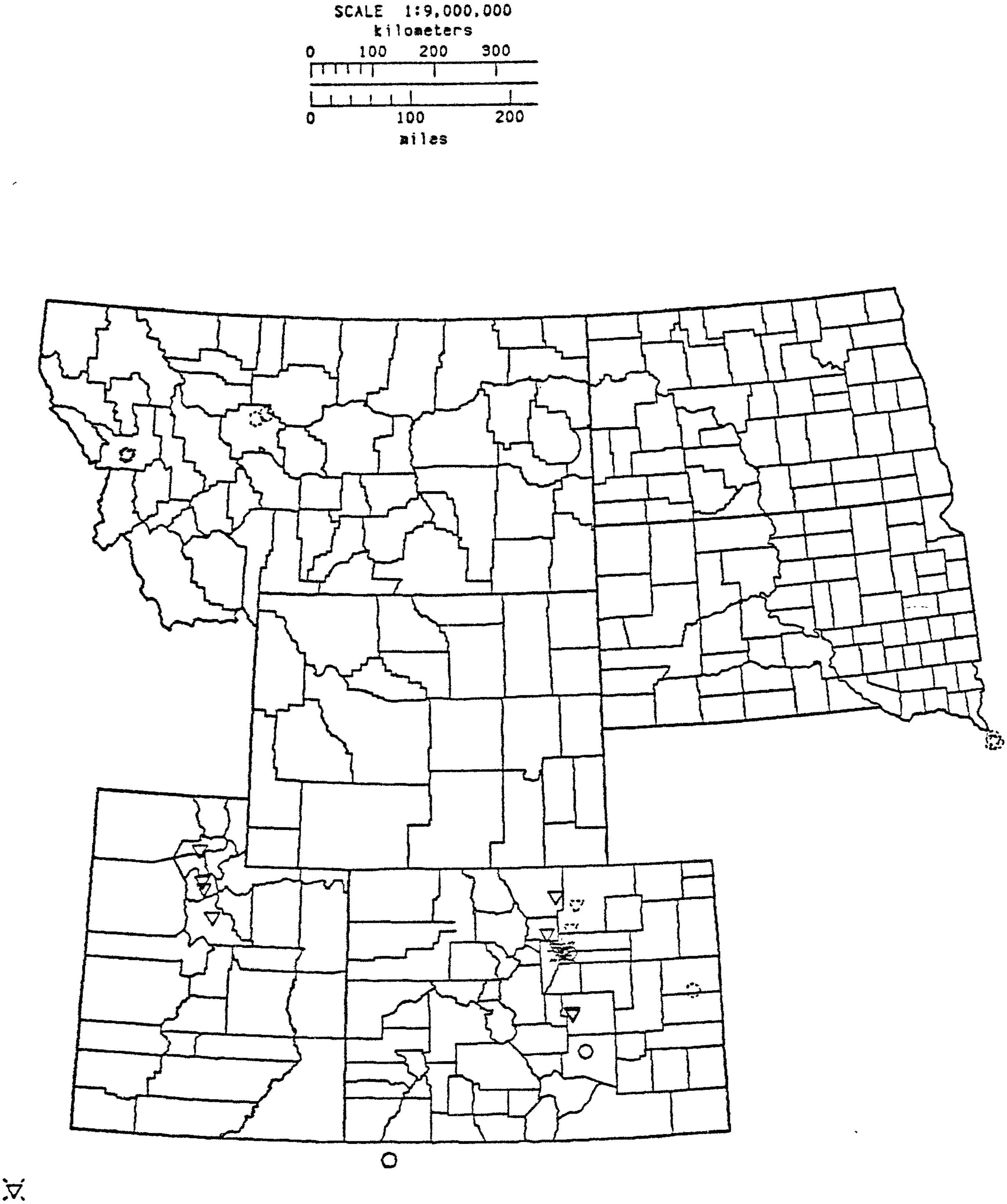


FIGURE 5. Alerts and Standards Map for CO -- 1981

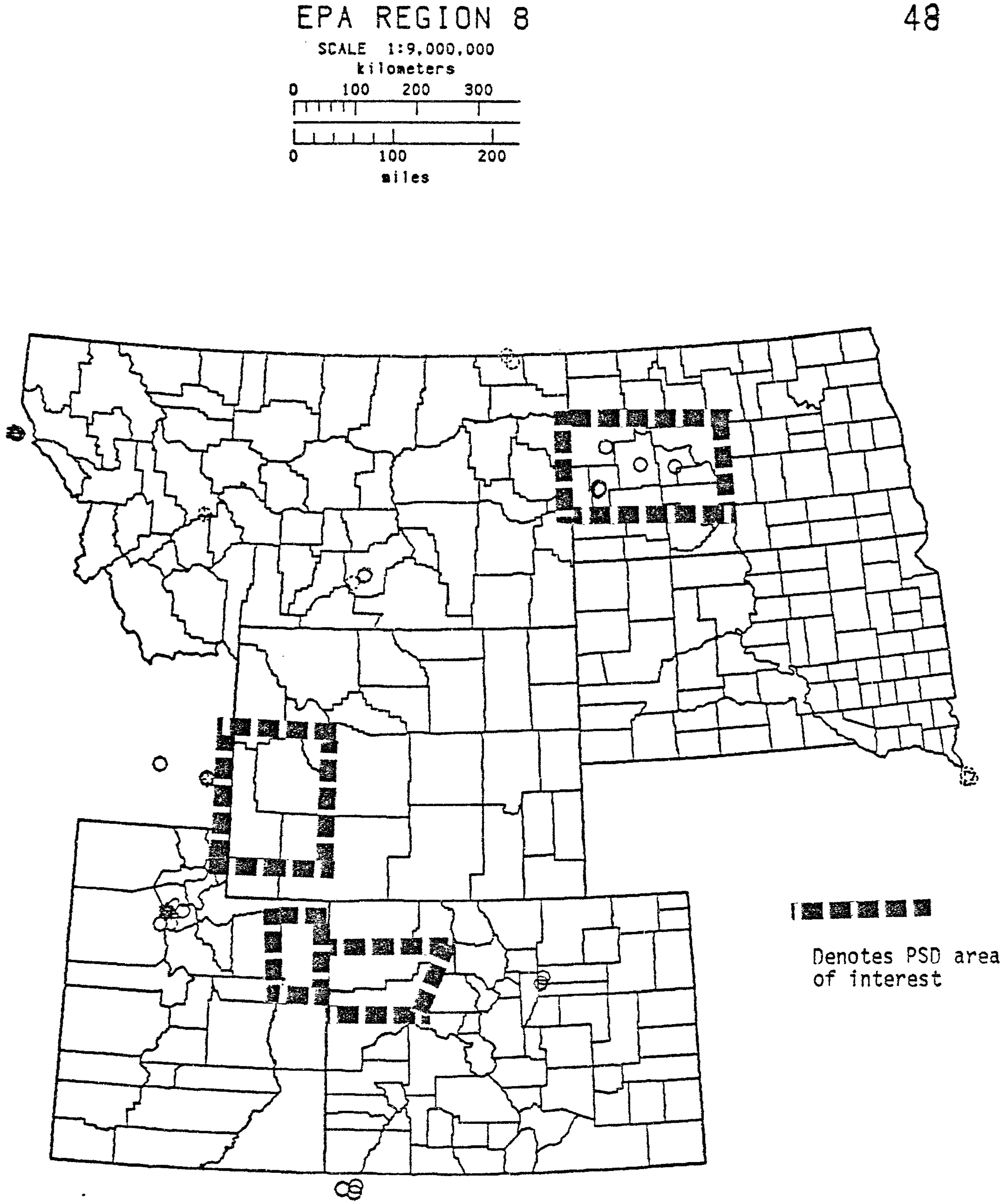


FIGURE 6. Alerts and Standards Map for SO2 -- 1981

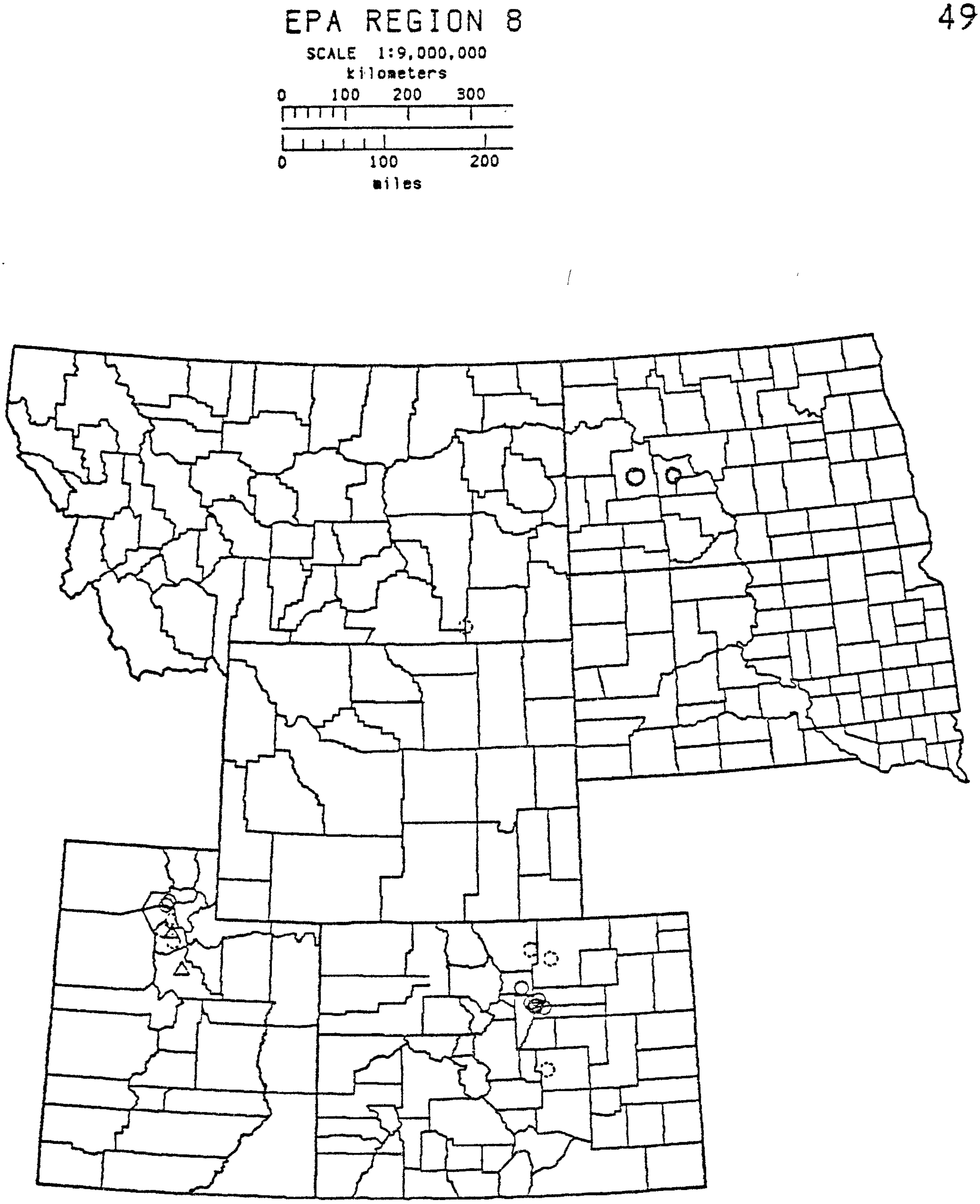


FIGURE 7. Alerts and Standards Map for O3 -- 1981

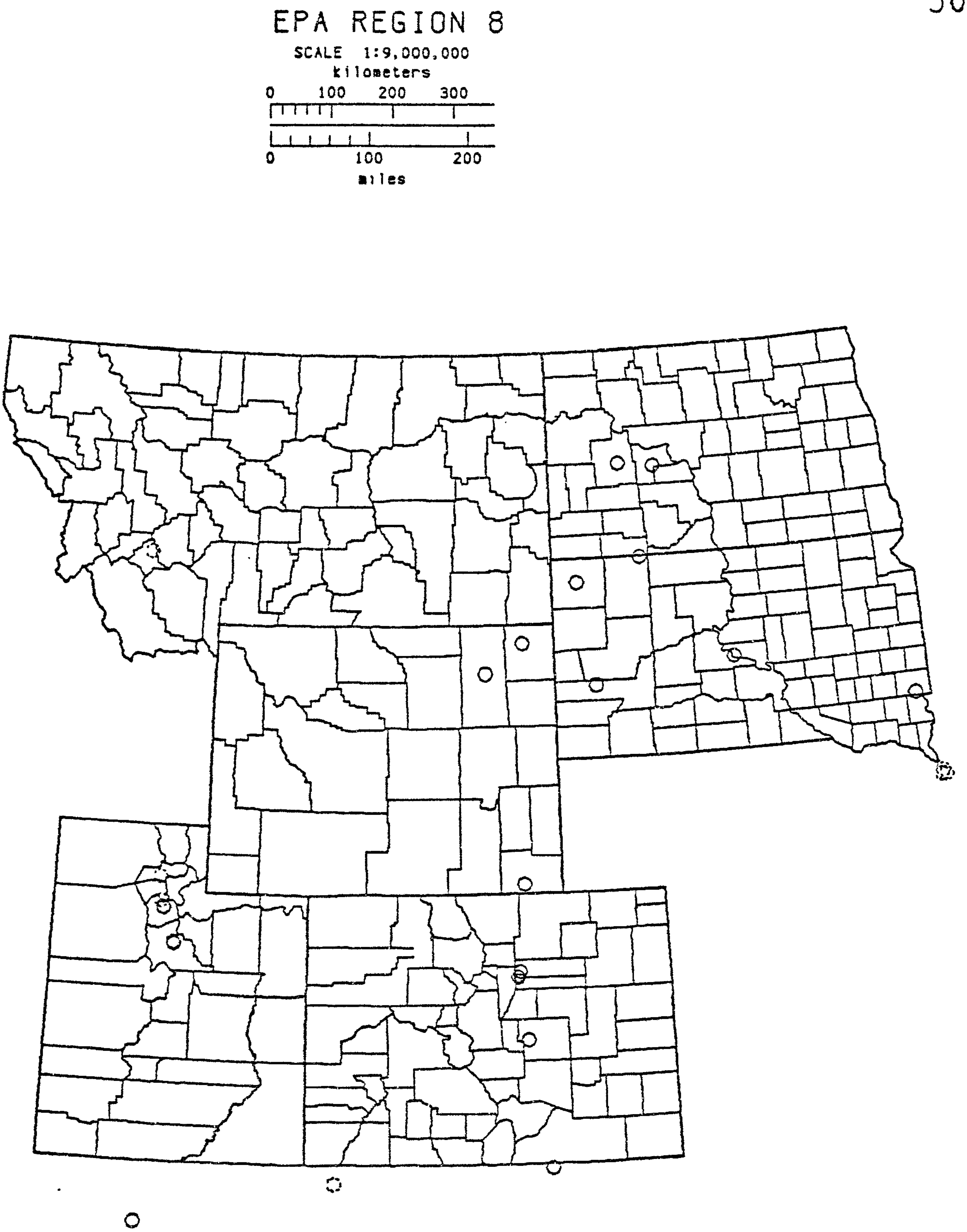


FIGURE 8. Alerts and Standards Map for NO2 -- 1981

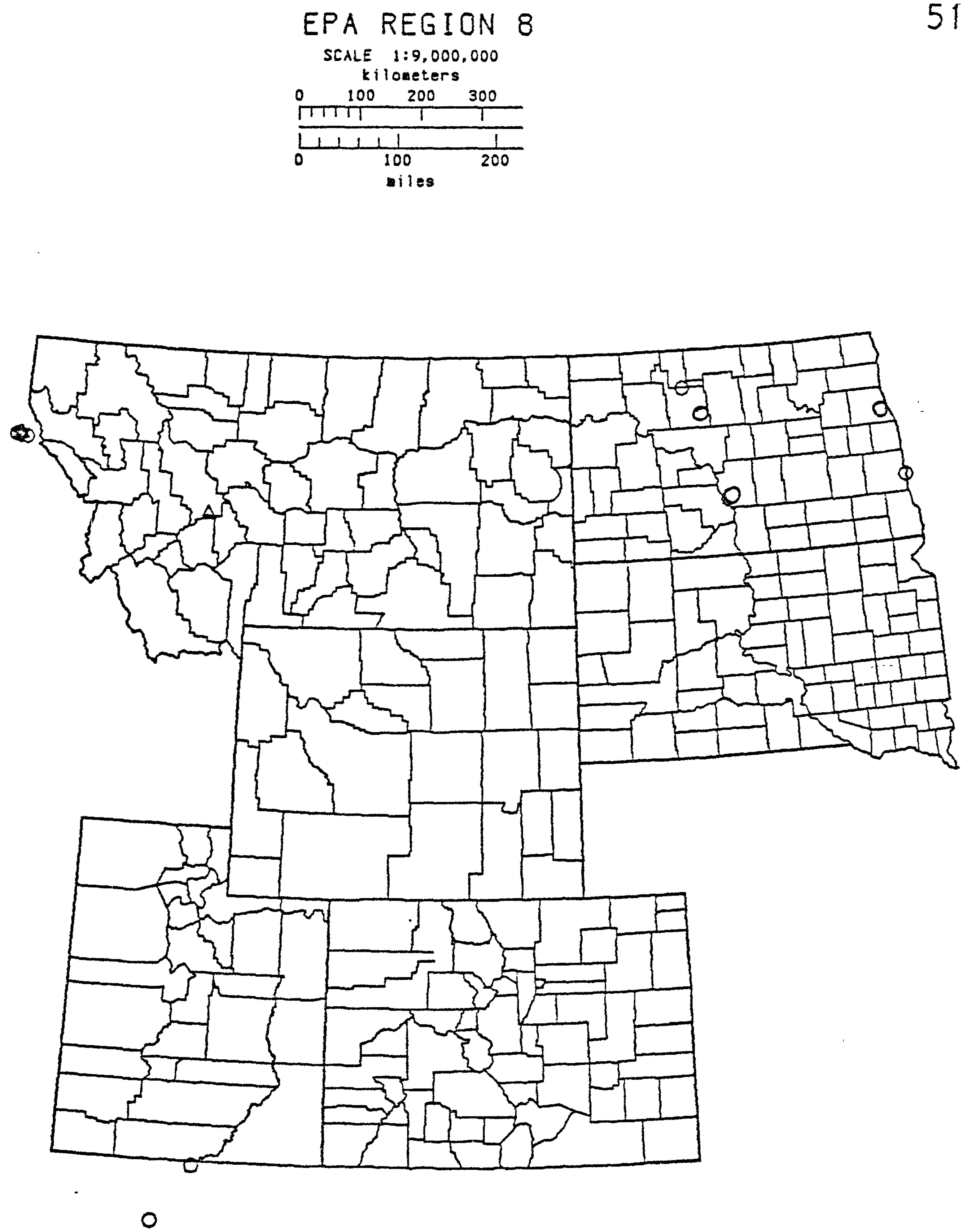


FIGURE 9. Alerts and Standards Map for PB -- 1981

COLORADO - DENVER METRO
AIR QUALITY MONITORING SITES

FIGURE 10:

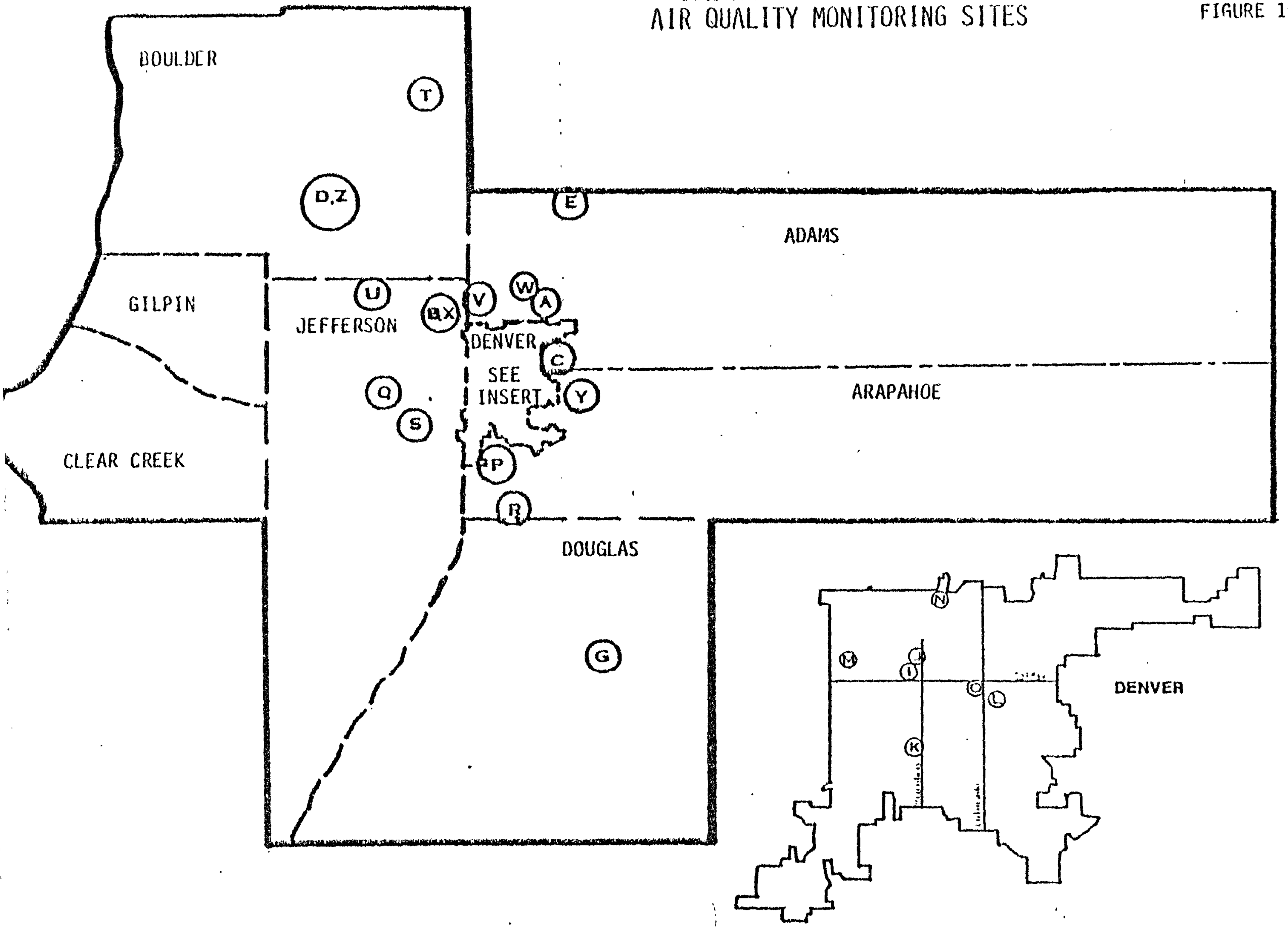


TABLE I: COLORADO - DENVER METRO

1981 PARTICULATE POLLUTANTS MONITORING SITES

TSP = Total Suspended Particulates
Pb = Lead

SITE	LOCATION	TSP	Pb
A	Adams city, 4301 E. 72nd Avenue	x(A)	
B	Arvada, 8101 Ralston Road	x(P)	
C	Aurora, 1633 Florence	x	
D	Boulder, 13th & Spruce	x	
E	Brighton, 15 S. Main St.	x	
G	Castle Rock, 208 3rd St.	x	
I	Denver, 414 14th Street	x(P)	x
	Denver, 414 14th St. (colocated)	x(P)	
J	Denver (CAMP) Broadway & 21st	x(A)	x
K	Denver, 1050 S. Broadway	x(P)	x
L	Denver, 4210 E. 11th Avenue	x	
M	Denver (CARIH) 21st Ave & Julian St.	x	x
N	Denver, E. 51st and Marion	x(A)	x
P	Englewood, 4857 S. Broadway	x(P)	
Q	Golden, 911 10th Avenue	x	
R	Highland Reservoir, 8100 S. University	x	
S	Lakewood. 260 S. Kipling	x	
T	Longmont, 4th and Kimbart St.	x	
U	Rocky Flats, Plant Entrance	x	
V	Westminster, 70th and Utica	x	

- = Discontinued in 1981.
+ = New in 1981.
x = Continues in 1981.
(A) = Exceeded Alert Level
(P) = Exceeded Primary Standard

TABLE II

COLORADO - DENVER METRO

1981 GASEOUS POLLUTANTS MONITORING SITES

CO = Carbon Monoxide SO_2 = Sulfur Dioxide
O_3= Ozone   WIND = Speed and Direction
NO_2 + Nitrogen Dioxide   TEMP = Temperature

SITE	LOCATION	CO	O_3	NO_2	SO_2	WIND	TEMP
X	Arvada, W. 57th & Garrison	x(P)	x(P)			x	
Y	Aurora 50 S. Peoria	+	x	+	-	x	
Z	Boulder 2320 Marine St.	+(P)	+			+	+
J	Denver (CAMP) Broadway & 21st Street	x(A)	x	x(P)	x		
M	Denver (CARIH) 21st Ave. & Julian	x(A)	x(P)			x	
O	Denver (NJH) Colorado Blvd. & Colfax Ave.	x(A)					
R	Highland Reservoir 8100 S. University	x	x(P)			x	x
W	Welby 78th & Steele	-	x	x	x	x	x

- = Discontinued in 1981.
+ = New in 1981.
x = Continues in 1981.
(A) = Exceeded Alert Level.
(P) = Exceeded Primary Standard.

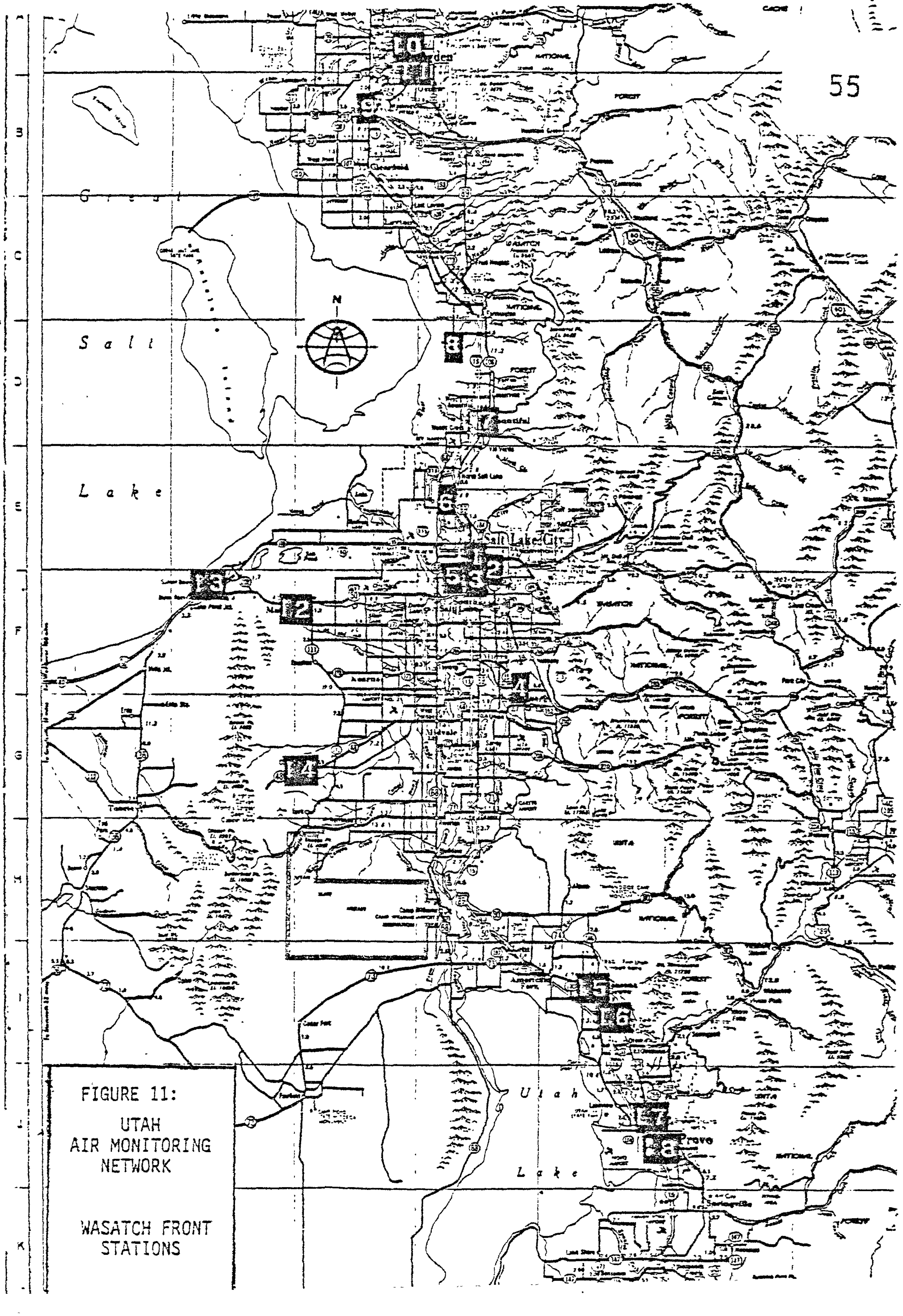


FIGURE 11:
UTAH
AIR MONITORING
NETWORK

WASATCH FRONT
STATIONS

TABLE III UTAH

1981 WASATCH FRONT AIR MONITORING STATIONS

Map Number	Station Name and Address	TSP	O_3	SO_2	CO	NO_2	WD/WS
1	Air Monitoring Center 261 West 500 South, Salt Lake City	X*					
2	Salt Lake City 460920001F01 610 South 200 East, Salt Lake City	X	P X*	X*	P X	X	X
3	State Street 460920008F01 219 South State St., Salt Lake City				P X*		
4	Cottonwood 460900003F01? 5715 South 1400 East, Holladay	X	X*		X*		X
5	Jordan River 460920009F02 1420 South 1100 West, Salt Lake City			X			X
6	North Salt Lake ? 1795 North 1000 West, Salt Lake City	X		X			X
7	Bountiful 460060001F01 65 West 300 North, Bountiful	X	P X*	X*	X*		X
8	Farmington 460220002F05 1325 West Glovers Ln., Farmington		P X				X
9	Roy 460860001F01 5320 South 2100 West, Roy	X	X*		X*		X
10	Ogden 460680001F01 2570 Grant Avenue, Ogden	X			P X	X	X
11	Washington Boulevard 460680005F01 2954 Washington Blvd., Ogden				X*		
12	Magna 460520001F02 2935 South 8560 West, Magna	A X		X*			X
13	Beach 460520902P02? 12600 West I-80, Magna			X			X
14	Copperton 461030001F02 8536 West State Highway 48, Copperton			X			X
15	Pleasant Grove 460760001F01 700 East 200 South, Pleasant Grove	A X					X
16	Lindon 461220001F01 50 East Main, Lindon	A X					X
17	North Provo 460800002F01 1355 North 200 West, Provo	X			X*	X	X
18	University Avenue 460800001F01? 25 North University Ave., Provo				P X*		

*Air Pollution Index Parameters Reported

A - Exceeded alert level
P - Exceeded primary standard

Water Quality
Environmental Management Report

REGION VIII ENVIRONMENTAL MANAGEMENT REPORT
WATER QUALITY MEDIUM

PART I: INTRODUCTION

Region VIII enjoys generally high quality water, and although we are committed to restoring the quality of the surface waters in Region VIII, we are intent on preserving the characteristics of the existing high quality waters which are so valuable to the people of this Region.

The Water Quality Medium Environmental Management Report presents for each state, a narrative description of the more significant water quality problems. It provides maps showing priority problem areas, with tables designating the stream segment analyses, and listing the water quality problems by source category. All of the water quality problems in each state are not included in this document. This regional summary identifies primarily the priority areas agreed on by EPA and state senior management. The subsequent recommendations may formulate a focus for future distribution of resources. They reflect various activities associated with problem areas defined for Region VIII.

A. CONCLUSIONS AND RECOMMENDATIONS

- Nonpoint source loadings of nutrients, sediment and salinity constitute the major causes of water quality standards violations in Region VIII.
- Municipal discharges of ammonia, chlorine, organic material and bacteria present the greatest impediment to achieving the 1983 fishable/swimmable goals of the Clean Water Act.
- Discharges of heavy metals from inactive/abandoned mines present the greatest nonmunicipal source of toxics which threaten the fishable goal of the Clean Water Act.
- Priority lists for construction grant activities do not clearly define or identify their relationship to state water quality standards.
- A large number of regulations and guidelines in these programs have never been finalized and are behind schedule. This continues to hamper regional and state workload planning. The status of all HQ activity in this area should be summarized and discussed at the mid-year review. (Water Quality Standards, TMDL's, WLA, CPP and NPS).

- Implementing control regulations on high quality waters, i.e. those with quality better than the 1983 goals, has been difficult in Region VIII. Many of the water bodies in Region VIII are of high quality and the Region is in the process of developing a procedure to: 1) define existing quality through a computerized, flow-weighted analysis, and 2) define significant change in existing quality. Because most of our (State and EPA) monitoring efforts have been concentrated in areas where we have water quality problems, the lack of water quality data and flow monitoring are frustrating our efforts in high quality areas.

- Lack of sufficient funds, qualified personnel and data, especially biological, are the major obstacles which could, and presently do, impair the successful implementation of the proposed use-oriented water quality based control program articulated in the proposed regulations on a large scale. EPA and the states in Region VIII have, for the past ten years, oriented funding program, resources and data collection to a treatment technology based control program. Little attention has been directed toward the control strategies envisioned in the proposed regulations. As a result, the States and Region VIII will be forced to redirect already underfunded and understaffed programs to accommodate these new strategies.

- There are major salinity problems in Region VIII outside the Colorado River Basin. Although the only significant effort to address salinity problems is within the Colorado River Basin. EPA should at least discuss with the states in Region VIII some of the problems, particularly in the Arkansas River Basin.

- Depletion of stream flows by increasing amounts of consumptive use continues to threaten the nonconsumptive uses of Region VIII streams. In order to protect the fishery, recreation and other uses, states like Montana and South Dakota have established programs to design strategies and methodologies to protect instreams flows. These strategies will be implemented in the near future.

- Pesticide monitoring in Region VIII waters has been very limited. The limited monitoring has not shown any problems in this area, although an expanded monitoring program is needed because of the large volumes of pesticides used in Region VIII.

B. METHODOLOGY

The 1981 water quality data on fifty water quality parameters for 268 monitoring stations along 11,200 miles of the principal surface water bodies in Region VIII were analyzed by Region VIII's Use Impairment Program. Parametric coverage included those parameters which when in excess of selected criteria, could impair any of the seven major designated beneficial stream uses identified in Region VIII. These data were processed by computer along with the beneficial use criteria which were originally developed as part of each states water quality standards.

Of the water quality data analyzed in Region VIII, about ten percent of the stations yielded results of no beneficial use impairment. These results should, however, be viewed with cautious optimism as only a limited number of water quality parameters were sampled and the result may not be representative. The results for 87 stations (32% of the total) indicated that the observed water quality parameters exceeded the recommended criteria only occasionally and at minimal levels. Potential use impairment levels were observed at 127 stations (47% of the total) and the remaining 25 stations (10% of the total) produced very high use impaired values.

It is important to note that elevated use impairment values are not absolute indicators of impaired uses. The use impairment values are used as a screening tool; the higher the use impairment value the higher the probability that a use is being impaired. Confirmation of an impaired use can only be accomplished through discussion with state personnel and on-site investigation. This report concentrates on those water bodies for which we have such confirmation and which were identified in the State 305(b) report as the priority water bodies.

C. STATUS AND TRENDS IN WATER QUALITY

Aside from STORET, there is no central source of stream water quality information in Region VIII. For many apparent problem segments basic information is not available, and when it is, it is frequently old and obsolete. For those segments with recent data, coverage is sporadic and inconsistent, making stream-by-stream comparisons tenuous at best. There is a great deal of variation in parameter and station coverage, information reliability, timing and frequency of sampling from one segment to another. Hence, the results of any ranking must be used with caution, and only as a first approximation.

Trend analyses per se, have not been attempted for these same reasons. Water quality in Region VIII streams is highly correlated with seasonal fluctuations in the natural hydrologic cycle. High streamflows are associated with naturally large concentrations of sediment and high turbidity; low streamflows are associated with larger concentrations of dissolved materials and lower turbidity. If year-to-year water quality samples are not taken during comparable times in the hydrologic cycle - which is often the case - then the apparent water quality trend will be an artifact of sample timing, and the true trend will remain unknown. Even if year-to-year samples are taken from comparable points on the hydrologic cycle, there will be differences in streamflow, which must be factored into the quality analysis. In may cases, streamflow information is not available to statistically weight streamflows to arrive at a true and reliable assessment of water quality trends. Region VIII is, however, developing a procedure to flow-weight water quality data.

Of these problems, the most serious impediment to severity and trend analysis is the scarcity of regular monitoring data from apparent and potential problems segments. Because of the great expense involved in monitoring, only the Federal government can afford to do the bulk of the water quality monitoring in Region VIII. The Federal monitoring network has been geared largely to energy impact areas and to national trend monitoring. Hence, the stations tend to be project specific or on the larger rivers where pollutants are more readily diluted and where pollution sources are obscure and problematic. The most significant data gap in Region VIII is biological; biological data is virtually absent. This deficiency will greatly hinder Region VIII's ability to develop site-specific water quality standards recommendations.

Aquatic life protection uses and recreational water uses are the uses most frequently impaired by pollution in Region VIII. To a lesser extent, water classified for public water supply protection and for agricultural use are also impaired.

Un-ionized ammonia, low dissolved oxygen and elevated nutrients are the parameters associated with municipal wastewater treatment facilities which appear to be having the greatest effect on aquatic life. Cadmium, copper, lead and zinc contamination from active, inactive or abandoned mining operations are suspected of having severe effects on aquatic life.

Nonpoint source pollution constitutes, by in large, the principal cause of the water quality problems in Region VIII, with some states reporting that over 90% of their water quality problems are due to natural and human-induced nonpoint source pollution. Sediment, nutrients and salinity are the parameters which are responsible for most of the use impairment observed in Region VIII. Fecal coliform from nonpoint sources and inadequately treated wastewater cause frequent recreational use impairments.

Some of the more signigicant water quality problems in Region VIII remain unresolved. These problems are being addressed through programs such as:

- Upper Colorado River Basin Salinity Control Program
- Water Quality Standards (use attainability & site-specific criteria)
- NPDES Discharge Permits
- Wetlands and 404 Permits
- Clean Lakes Programs
- Nationwide Urban Runoff Program
- Construction Grants Program
- Continuing Planning Process
- Agricultural Conservation Program (Dept. of Agriculture)

PART II: REGIONAL OVERVIEW OF WATER QUALITY ISSUES - SIGNIFICANT WATER QUALITY PROBLEMS

COLORADO

The thrust of the Federal Clean Water Act is to restore and maintain the quality of the nation's waters. Thus, impaired stream segments in Colorado reflect those areas where stream segments have not yet achieved the use or quality deemed advisable and desirable by the State and EPA. (See Figure #1 Colorado Map; Table 1.)

The most significant water quality impairments in Colorado are due to fecal coliforms and/or ammonia. Discharges from municipal wastewater facilities are the primary cause of the impairments. Both recreational uses and aquatic life are affected.

Segment 10 of Boulder Creek is the only Class II recreational water body in Colorado not consistently meeting its adopted standard for fecal coliform. The data indicates that Boulder Creek would also frequently have a problem meeting the criterion for a Class II recreational stream. The station evaluated on Boulder Creek is downstream from the City of Boulder and from the confluence with Coal Creek. There is one municipal discharge to Boulder Creek and three discharges to Coal Creek. Earlier studies by the Division have indicated that Coal Creek is a major source of degradation to water quality in Boulder Creek. Only the town of Erie was significantly out of compliance with their discharge permit limits for fecal coliforms during the evaluation period.

All of the stream segments impaired because of fecal coliforms are in areas of intensive agricultural land use and are downstream of major municipal point source discharges. Many of the municipal dischargers to impaired segments commonly have had a problem in meeting their permit limits for fecal coliforms during the evaluation period.

Concentrations of un-ionized ammonia impaired both Class I and Class II aquatic life streams. With the exception of the Dolores River below the confluence with the San Miguel River, the primary source of ammonia is municipal wastewater. Water quality standards allow higher concentrations of ammonia in the San Miguel River below Uravan than are allowed in the Dolores; however, the ammonia load from the San Miguel causes the Dolores to exceed its adopted standard.

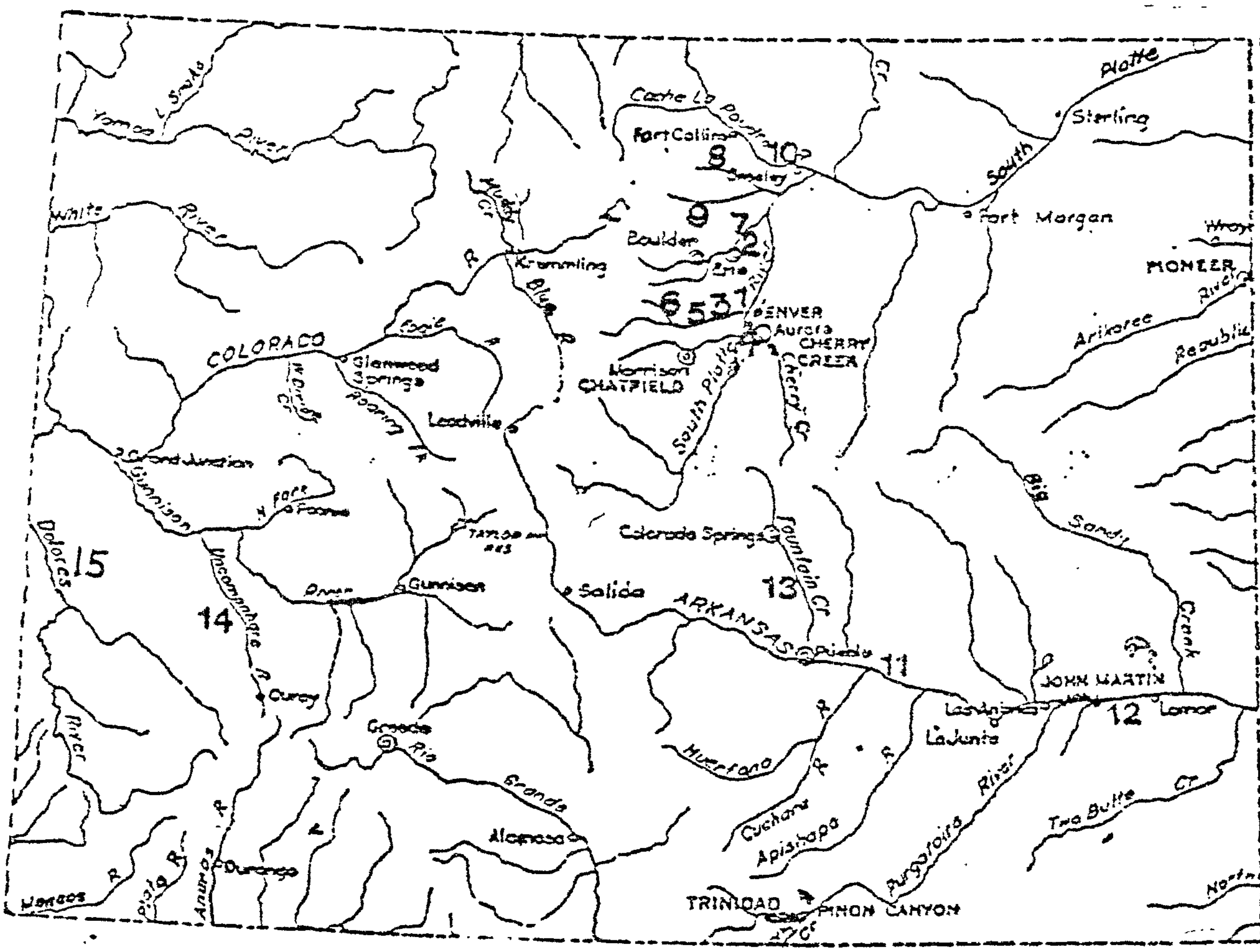


FIGURE 3. COLORADO WATER QUALITY PROBLEM AREAS

1 - South Platte River (Hampden to Henderson)
2 - Boulder Creek (Coal Creek to St. Vrain Creek)
3 - Clear Creek (Youngfield to mouth)
4 - Cherry Creek Reservoir
5 - Clear Creek (Idaho Springs to Youngfield)
6 - North Fork Clear Creek
7 - St. Vrain Creek (Longmont to mouth)
8 - Big Thompson River (Loveland to mouth)
9 - Little Thompson River (Berthoud to mouth)
10 - Poudre River (Ft. Collins to mouth)
11 - Arkansas River (I-25 to La Junta)
12 - Arkansas River (La Junta to Stateline)
13 - Fountain Creek (Monument Creek to mouth)
14 - Uncompahgre River
15 - Dolores River (San Miguel River to mouth)

Gore Creek, the Crystal River, and the North Fork of the Gunnison have Class I aquatic life designations and have experienced ammonia problems during the evaluation period. Since there are no municipal point source discharges to the Crystal River the source of ammonia is unknown. Ammonia exceedance on Gore Creek occurred downstream of a major municipal discharger that was experiencing operational problems during the time of peak winter recreational use in the evaluation period. A fish hatchery, a dairy, and several small municipalities discharge to the North Fork. Any or all of these sources could have contributed to the problem on the North Fork.

The major un-ionized ammonia concerns in Colorado occur on the South Platte River from near Bowles Avenue in the Metro Denver area to approximately Platteville, Clear Creek below Youngfield Street, the St. Vrain River below Longmont, and Boulder Creek below Boulder. All four stream segments violate their un-ionized ammonia standard on a low to moderate frequency rate. The watersheds of all four of these streams are expected to encounter major population increases during the next twenty years. Therefore, without proper measures, both the frequency and the magnitude of the violations may increase in the future.

Many of the remaining stream impairments in Colorado are due to several heavy metals (lead, cadmium, copper, zinc,) which exceed the standards established for cold water aquatic life. With the exception of Ten Mile Creek in Summit County, reductions in concentrations of these metals may be contingent upon the control of drainage from inactive or abandoned mine tails or tunnels. The Molybdenum mine at Climax is the major point source discharge to Ten Mile Creek. Seasonal standards for metals have set for Ten Mile Creek which will protect the established aquatic life between Copper Mountain and Dillon Reservoir. Metals which are associated with present or past mining activities or natural geologic conditions, have impaired only aquatic life with the single exception of the Eagle River. The utility of the Eagle River for municipal purposes has been significantly diminished because of the concentration of manganese which exceeds the adopted standards for water supply.

A study published in 1974 by the U.S. Geological Survey identified 450 stream miles in Colorado that had been impacted by metal mine drainage. Water quality impairment was attributed to ongoing, as well as past mining operations and natural mineral seeps. Damage to the aquatic environment was caused by a number of factors including flow from drainage tunnels, milling operations, and tailings piles. Restoration of several segments owing to the control of point source discharges at active locations or to the clean up of inactive mine areas has been accomplished. Feasibility studies are under way at several other locations in order to take advantage of reclamation funds that may become available in the future.

MONTANA

The most significant water quality problems in Montana are sediment, salinity and problems arising from water depletion. A recent effort was made to identify and prioritize Montana problem stream segments. A total of 216 stream segments were identified as problem segments (See Appendix A, Table 2). Sufficient recent data was only available, however, to develop pollution severity indices for 99 of these segments. Thirty-two of these problem segments were judged to be largely man caused and improvable under existing regulatory authority and pollution control programs. These 32 segments form Montana's priority waterbodies list upon which regulatory and planning efforts are focused.

During the past two years Montana's surface water quality standards have been revised. Policies for establishing permit levels for ammonia, chlorine residuals, and oil and grease have been modified. This includes eliminating the need to chlorinate many wastewater treatment plant effluents during winter months. New rules to implement the State's nondegradation law have been prepared. Developments are routinely reviewed and monitored for potential impacts to water quality. These include lakeshore subdivisions, new and modified hydroelectric and other energy projects, new and modified mining developments and new discharges.

It is estimated that over $50 million worth of work needs to be done to upgrade Montana's wastewater treatment facilities. Montana's major wastewater treatment funding needs should be met, however, if all construction grant funds currently authorized through FY 1985 are appropriated by Congress. During the last two years, more than $38 million has been provided to local governments for the construction of wastewater treatment facilities to improve water quality and protect public health. Studies are continuing to identify water quality problems attributable to wastewater treatment discharges. It is estimated that eight municipal treatment plans are causing some degree of ammonia toxicity to aquatic life in streams receiving the discharges. Mining and milling activities and petroleum refining activities provide the more significant industrial point source discharges in the State.

Most of Montana's water quality problems result from nonpoint sources of pollution. Agricultural, mining, and forestry related activities are the principal land use practices which impact Montana water quality. This includes; acid mine drainage and toxic metal contamination from mining activities; accelerated erosion and stream sedimentation from hydrologic modifications and improper land management; and excess sediment, nutrients, pesticides and other contaminants from runoff. Planning, technical assistance, and educational efforts which define and disseminate information on the relation of land use to water quality have been the chief mechanism used to address these nonpoint pollution problems. Sharing in these efforts are the Water Quality Bureau, one of the four original areawide planning organizations, several Indian tribes, and a host of local, State and Federal governmental agencies.

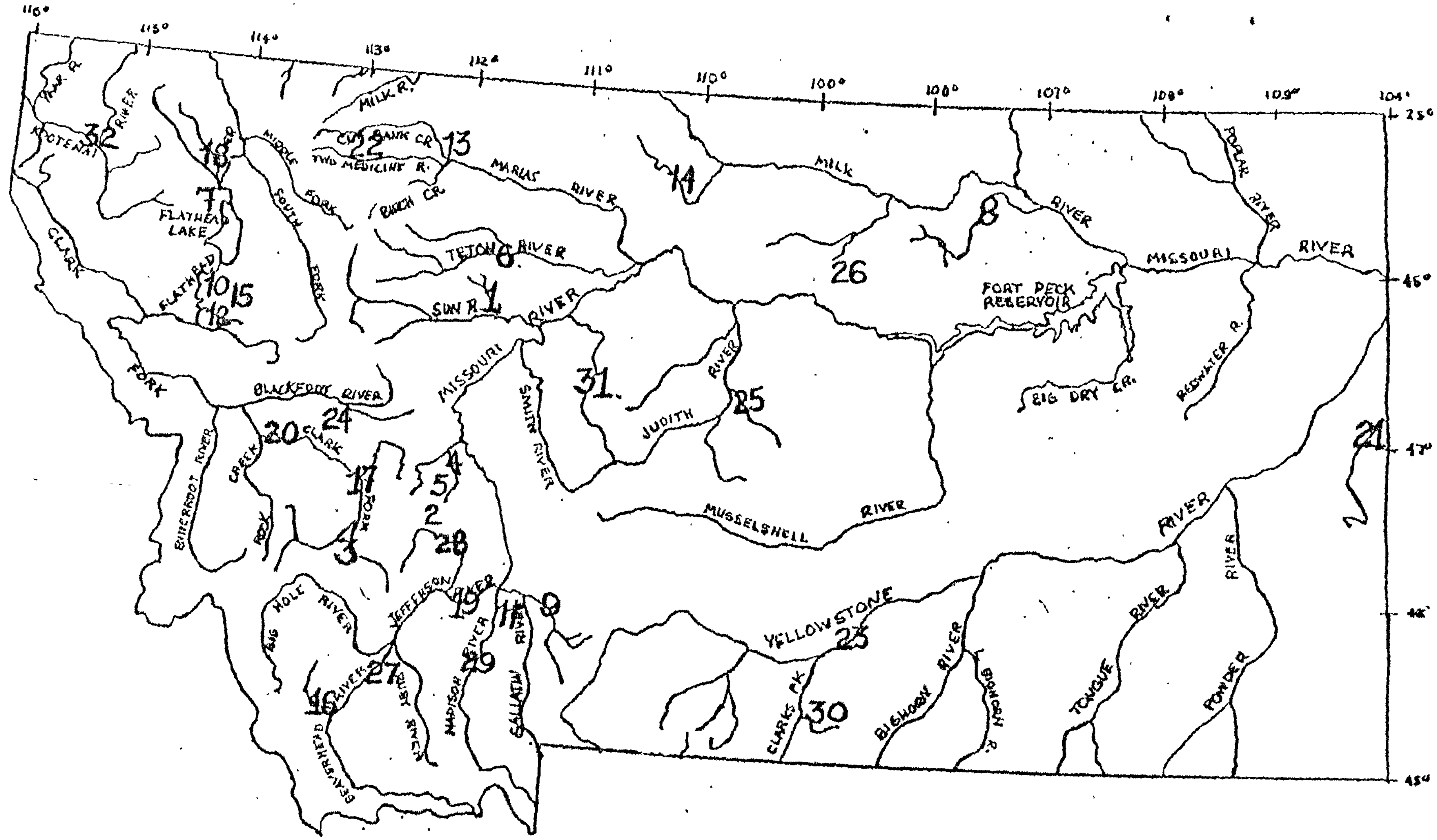


FIGURE 2: MONTANA WATER QUALITY PROBLEM AREAS

Success in correcting nonpoint source problems is limited by difficulties in implementing changes to long standing and accepted land use practices, and lack of funds for implementation. Important funding sources to implement better land management practices include the Department of Agriculture's Agricultural Conservation Program and Small Watershed Program, and the State of Montana's Renewable Resource Development and Water Development Program. EPA's Superfund Program and the Department of Interior Office of Surface Mining's Abandoned Mine Land Reclamation Program offer some hope for correcting water quality problems resulting from abandoned mining operations.

Dewatering of streams in Montana contributes to water quality degradation. Dewatering reduces a stream's dilution capacity and decreases biotic habitat. Dewatering is primarily caused by irrigation withdrawals. This is most noticeable on the Beaverhead, Bitterroot, West Gallatin, Big Hole and Jefferson Rivers, although it occurs on many other stream segments.

The Department of Health and Environmental Sciences has been awarded an instream flow reservation on the Yellowstone River for the purpose of protecting public water supplies. Water development projects on the Yellowstone are monitored to ensure compatibility with the instream reservation. Efforts to develop a similar instream flow reservation on the Clark Fork River have been halted since a downstream hydroelectric water right serves to protect instream flows.

Montana's severest groundwater problem results from saline seep. This phenomenon is caused by the dryland farming practice of summer fallowing. Excess soil moisture accumulates when vegetation is removed, and the moisture leaches salts from the soil and salinizes groundwater. Surface waters also become salinized by this phenomenon when the salinized groundwater feeds them.

There are areas in Montana that have very high environmental value. One of these areas is the Flathead River Basin in northwest Montana which includes Glacier National Park, Flathead Lake (the largest lake west of the Mississippi), several designated Wild and Scenic Rivers, the Flathead Valley, and the Bob Marshall Wilderness area (the largest in the west). Proposed major Canadian coal development, oil and gas development and other general development activities threaten to degrade these nationally significant resources. Accelerated nutrient contributions to Flathead Lake from changed land use and wastewater discharges are a specific concern.

A five year Congressionally authorized $2.6 million Flathead Basin Environmental Impact Study has recently been completed. This study has defined baseline conditions in the Basin and served to focus increased attention and resources on maintaining the air, water quality, fisheries, groundwater, wildlife and general high environmental values of the area. The Montana Legislature is expected to create a Flathead Basin commission to protect this resource.

The Clean Water Act goal of "fishable and swimmable water" by 1983 will not be met for more than 200 stream segments in Montana. Without an infusion of implementation funds for correcting existing nonpoint source pollution problems, Montana's list of problems segments won't be much shorter in 1984. However, with adequate funding for the pollution control programs described in Montana's 305(b) report, the list should not be longer.

NORTH DAKOTA

North Dakota anticipates that the quality of its surface waters will gradually improve. At the present time, the Missouri River is the only stream which consistently meets the swimmable, fishable standards. An additional 31 streams are presently meeting or should meet these goals by 1983. This represents approximately 80 percent of the streams in North Dakota. (See Figure #3; Appendix A, Table 3).

Presently there are no municipal facilities in North Dakota discharging completely untreated wastes into the waters of the State. Some however, provide less than the desired level of treatment for several reasons, such as a lack of storage capability or a lack of resources to provide upgraded treatment. North Dakota projects that a number of municipalities will need additions, modifications, or completely new facilities in order to comply with permit requirements.

There does not appear to be any significant stream degradation problems from major industrial dischargers. Major industrial sources include power plants, sugar beet processing plants, and oil refineries. Minor industrial sources include potato washing plants, gravel operations, water treatment plants, and coal mines. Most industrial point source discharges are non-continuous or intermittent discharging stablization ponds or lagoon systems.

There are a few combined sewer systems located in the older cities in the State. The major problem with combined sewers is the overflow discharge of diluted, untreated wastewater to a stream or other receiving body as a result of intermittent heavy flows due to rainstorms or snowmelt. There is no hard data on the quality of combined sewer system overflows or the amount of degradation on secondary streams. Most of the affected cities are presently involved in combined sewer separation projects.

All the major cities and several of the minor cities in the State have existing storm sewer systems. Because of an increase in urban population in the past years, there has been an increase in urban areas contributing to storm sewer discharges. Urban runoff characteristics are highly variable depending upon the density and duration of the storm, the management of street sanitation, and the contributions from adjacent runoff areas.

Nonpoint pollution sources are responsible for most of the surface water degradation in the State. The Department's Surface Water Quality Monitoring Program has indicated that the quality of surface waters has not been enhanced comparatively with the rapid advances that have been accomplished during the past years by municipalities, industries, and other point sources in providing adequate treatment of their wastes. Violations of certain parameters of the State's Water Quality Standards have been noted at times when records reveal there have been no discharges into the stream from any point sources.

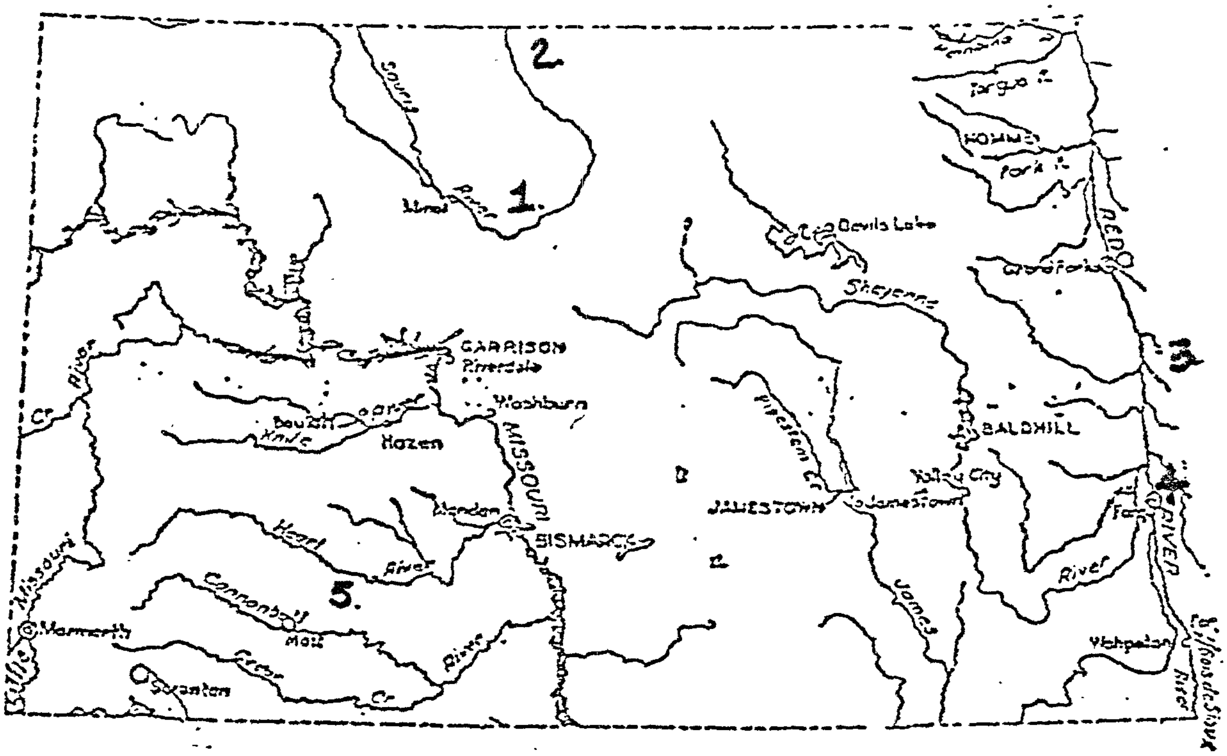


FIGURE 3 NORTH DAKOTA WATER QUALITY PROBLEM AREAS

1. Souris River - Des Lacs River to Deep River
2. Souris River - Deep River to Canadian Border
3. Red River - Turtle River to Sheyenne River
4. Red River - Sheyenne River to Wild Rice River
5. Heart River

Nonpoint pollutants include sediment and nutrients, wastes from stock raising activities, runoff from croplands, rangelands, pastures, farmsteads, and urban areas containing fertilizers, pesticides, and other pollutants. The Nonpoint Task Force of the Statewide 208 planning effort estimates that there are approximately 2.3 million acres within the State that are primary potential sources of pollution, and 3.6 million acres that are secondary sources. Some 2.5 million acres undergo slight soil erosion, 380,000 acres undergo moderate soil erosion and 81,000 acres have severe erosion problems. The Task Force identified 265,000 acres with high treatment priority needs and 2.7 million acres with secondary priority needs. These acreage figures do not include the ten-county Lewis and Clark Planning area.

The North Dakota nonpoint source control program to control pollution from agricultural activities is a voluntary program with emphasis in two areas: Watershed controls that are an integral part of lake restoration projects and demonstration projects which serve education, research purposes. The program has achieved significant success in select areas during the past two years.

The program has relied heavily on funding sources from ACP, Section 314 program, Section 106 program, Section 205(j) and 208 program, State Game & Fish, Soil Conservation Service and local funds. The initial Statewide 208 plan identified 10 target lakes that are known to experience water quality problems. These lakes were identified so that greater emphasis would be placed on assessing and controlling nonpoint sources of pollution, especially nutrient and sediment loadings. These lakes were selected on the basis of the Game & Fish Department's study on classification of lakes and the results of the National Eutrophication Survey conducted by EPA. The Game & Fish Department classification involved dissolved oxygen, fish kills and impairment of use.

The National Eutrophication Survey took into account nitrogen, phosphorous, chlorophyll and dissolved oxygen levels in the lakes. Existing and potential recreational value and usage in the lakes was another consideration in the selection of these target lakes. The 10 target lakes are as follow: 1) Lake Ashtabula, Barnes Co., 2) Brewer Lake, Cass Co., 3) Red Willow Lake, Griggs Co., 4) Brush Lake, McLean Co., 5) Sweet Briar Lake, Morton and Oliver Co., 6) Whitman Dam, Nelson Co., 7) Devils Lake, Ramsey Co., 8) Patterson Lake, Stark Co., 9) Spiritwood Lake, Stutsman Co., 10) Matejcek Lake, Walsh Co.

Brewer Lake, Devils Lake, Spiritwood Lake and Sweet Briar Lake watershed projects were initiated in the 1st phase of the nonpoint source control program. Spiritwood Lake was selected as a Phase II 314 project. To date the Spiritwood Lake watershed project has received a great amount of attention. Examples of BMP's installed includes 22,000 ft. of grass waterways, 9,860 ft. of terraces, 217,340 ft. of tree planting, 293 ft. of wildlife habitat seeding, 5 stock ponds, 19 ft. of critical area seeding, 644 ft. of no-till crop production. Planned practices for 1983 are one animal waste system, one no-till and tillage meeting, additional waterways, one pheasant waste storage and crop residue management.

A 5-counties (Ransom, Benson, McLean, Williams, Bottineau) no-till project was started in the fall of 1980 to demonstrate no-till production within this target area. Water quality problems stem from excessive sediment loadings into the lakes and streams from wind and water erosion and runoff from agricultural cropland. Fifty farmers signed up within this 5-county area.

Dissolved oxygen values were low in the Souris River at certain times of the year due to low, sluggish flows during the warm summer months and to low flows during the cold winter months when ice and snow cover prevented reaeration and sunlight penetration. Fecal coliform values were relatively high in the Red River of the North and Knife River Basins. The former is due to the dense population of that area and the latter to feedlots and municipal sources in the Basin. Phosphate values were highest in the eastern portion of the State, a trend perhaps explained by the denser vegetative cover and more intense agricultural practices. Chloride limits were not violated except in the northern Red River Basin. This may be attributable to flows from several highly saline lakes. Dissolved solids were high west of the Missouri River, which is not unusual considering the geological character of that area.

SOUTH DAKOTA

The impairment of beneficial uses of streams and rivers due to water pollution, ranges from none to severe in South Dakota (See Figure #4; Appendix A, Table 4). The most severe impairment is occurring in the Whitewood Creek/Belle Fourche River/Cheyenne River drainage. The sources of the pollution are mine tailings from more than 100 years of mining activities, current mine discharges, nutrients from municipal wastewater discharges, urban runoff, agricultural runoff, livestock, and wood preservation plants. Severe impairment is also occurring in the lower reaches of the White River, in the Bad River, and in Rapid Creek from Rapid City to the Cheyenne River. The problems in the White River are related primarily to erosion of the Badlands and livestock watering. Lack of flow, livestock watering, and soil erosion are the primary causes of water quality degradation in the Bad River. Lower Rapid Creek is degraded by urban runoff and effluent from the municipal wastewater treatment plant. Landowners along this reach report that livestock and wildlife will not drink the water and that the water causes skin irritation. These problems have not been documented or a possible source determined.

In 1981, the South Dakota Department of Water and Natural Resources (DWNR) examined lake water quality and produced a priority ranking for lake restoration in South Dakota. One hundred lakes were ranked so that restoration monies would be spent on the projects which would produce the most lake improvement and benefit the most people. The top ten priority lakes are Wall (Minnehaha County), Cochrane (Deuel County), Minnewasta (Day County), Brandt (Lake County), South Buffalo (Marshall County), Pelican (Codington County), South Red Iron (Marshall County), North Waubay (Day County), Hendricks (Brookings County) and East Oakwood (Brookings County). Most South Dakota lakes are severely impacted by runoff which carries silt and nutrients into them. Lake Madison is impaired by wastewater from the City of Madison, and Stockade Lake is impaired by wastewater from Custer.

Depletion of stream flows by increasing amounts of consumptive use continues to threaten the nonconsumptive uses of South Dakota streams. In order to protect the fishery, recreation and other uses, South Dakota has established a program to design strategies and methodologies to protect instreams flows. These strategies will be implemented in the near future.

Pesticide monitoring in South Dakota waters has been very limited. The limited monitoring has not shown any problems in this area, although an expanded monitoring program is needed because of the large volumes of pesticides used in South Dakota.

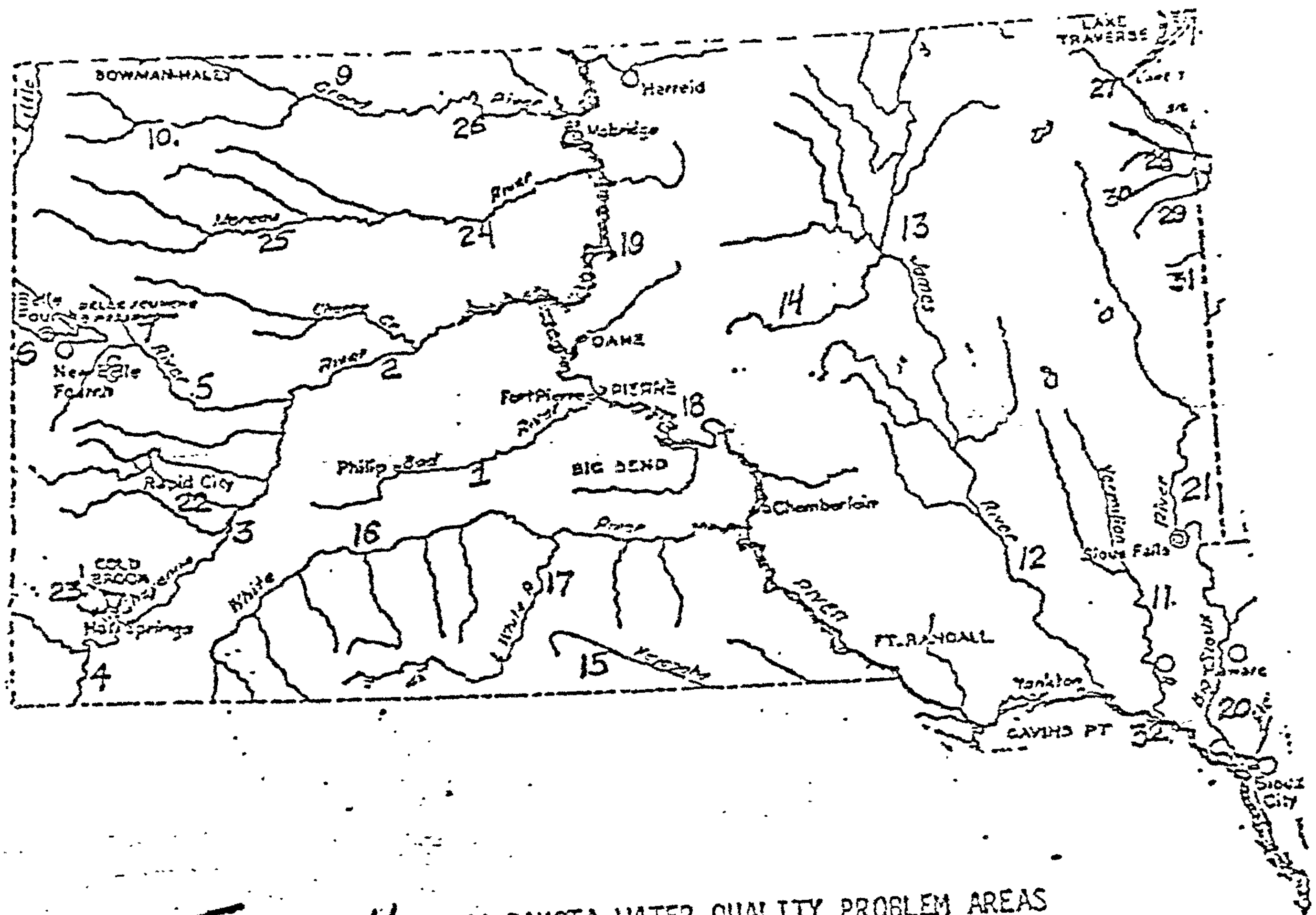


FIGURE 4. SOUTH DAKOTA WATER QUALITY PROBLEM AREAS

1. Bad River
2. Lower Cheyenne River
3. Middle Cheyenne River
4. Upper Cheyenne River
5,6. Belle Fourche River
7. Horse Creek
8. Middle Whitewood Creek
9,26. Grand River
10. South Fork Grand River
11. Vermillion River
12. Lower James River
13. Upper James River
14. Turtle Creek
15. Keya Paha River
16 White River
17. Little White River
18,19. Missouri River
20. Lower Big Sioux River
21. Upper Big Sioux River
22. Rapid Creek
23. Fall River
24,25, Moreau River
27. Little Minnesota River
28. Whetstone River
29. South Fork Yellow Bank River
30. North Fork Yellow Bank River
31. Lac Qui Parle (Gary Creek)
32. Missouri River - Sioux City to Yankton

Five lakes have been selected for the EPA Clean Lakes Program, and the Lake Herman project was one of seven Model Implementation Programs in the country. Implementation activities have been initiated in twelve watersheds. The DWNR is involved in the Black Hills Local Council of Governments urban runoff program, which is a three year program to determine the impact of Rapid City's urban runoff on Rapid Creek. The DWNR is also working with the protection of instream flows, management strategies for on-site sewage disposal and cooperative management strategies with the U.S. Forest Service and South Dakota Indian tribes.

The Construction Grants Program is responsible for the control of point sources of water pollution and the administration of Federal grants for the construction of municipal wastewater treatment facilities. This section has administered 86.9 million dollars in grants since 1972 which has resulted in the completion of 47 projects with 11 more currently under construction. A recent survey of 26 of those projects showed that pollutants were reduced by 72.4 to 80.2 percent. Surveys now in progress are designed to document actual improvements in stream water quality and aquatic communities. Tremendous improvements have already been seen in the James River and Whitewood Creek because of projects at Mitchell and Lead-Deadwood.

UTAH

The Utah Water Pollution Control Committee (UWPCC) has grouped the waters of the State into classes to protect the beneficial uses and has established numerical standards for water quality parameters for each of these uses. In order to monitor for attainment of these standards, the Bureau of Water Pollution Control has established over 500 active and semi-active stream sampling stations. Of these, 170 have been selected for trend analysis to determine water quality degradation or improvement.

Point sources present a geographically limited problem to water quality and are obviously more significant in the highly populated areas. Wastewater treatment facilities concentrated in certain drainages seriously impact the receiving streams because of the population loads. The important example is the Jordan River which flows from south to north through the Salt Lake Valley. There are currently eight municipal treatment facilities in operation which treat wastewater from a population equivalent of 700,000 and which discharge into the Jordan River.

Most remaining water quality problems in Utah result from nonpoint source rather than point source discharges. Nonpoint sources of pollutants include discharges from natural geologic formations, agriculture, urban runoff, hydrologic modification, mining, recreation, construction and silviculture. Natural sandstone formations in eastern and southern Utah contribute significant amounts of sediments through erosion. Natural deposits of salts, phosphates, fluorides, nitrates and arsenic also contribute to decreasing water quality in certain areas of the State.

The majority of the total water used in Utah is for agriculture. As a result, this is one of the primary sources of human induced nonpoint pollution. Diversion of waters for irrigation tends to concentrate salts and solids in original stream channels. Also, return flow discharges add salts, nutrients and sediments from croplands into stream channels. Overland runoff contributes salts and sediments from non-irrigated croplands and coliform bacteria from pasture land.

Utah and EPA have previously designated 23 stream segments in Utah as critical water quality problem areas in fiscal year 1981. Improved data analysis has allowed an updating of that Priority List (See Figure #5; Appendix A, Table 5). Utah's recent 305(b) report represents a continuing update of the priority stream segments. The Weber River and its tributaries from the Stoddard diversion to its headwaters is the most impaired stream for its designated uses. Recreational developments, agriculture and energy exploration in the headwaters of this stream segment are the primary reasons why it is the most impaired. Other segments that remain high on list are those which are most affected by high population (Provo River, Jordan River, Spanish Fork River). Nonpoint agricultural sources and salinity problems are the reasons why the other stream segments are on the priority list.

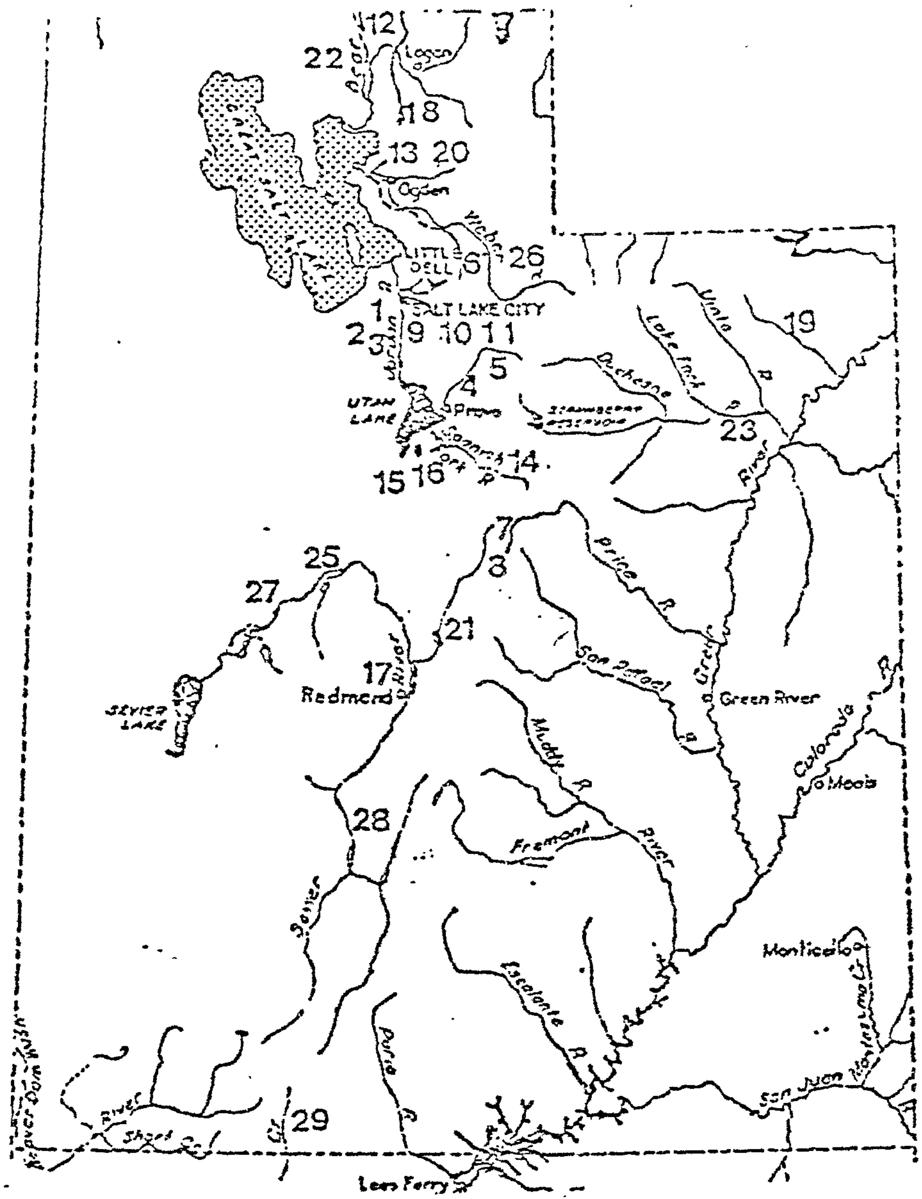


FIGURE 5: UTAH WATER QUALITY PROBLEM AREAS

1, 2, 3 - Jordan River
4 - Provo River
5 - Snake Creek
6 - East Canyon Creek
7 - Price River
8 - Pleasant Valley Creek
9 - Big Cottonwood Creek
10 - Little Cottonwood Creek
11 - Mill Creek
12 - Bear River
13 - Weber River
14 - Spanish Fork River
15 - Benjamin Slough
16 - Bear Creek
17 - Sevier River
18 - Little Bear River
19 - Ashley Creek
20 - Weber River
21 - San Pitch River
22 - Bear River
23 - Duchesne River
24 - Clarkston Creek
25 - Sevier River
26 - Fort Creek
27, 28 - Sevier River
29 - Kanab Creek

In its ongoing effort to identify and correct sources of pollution, Utah has implemented several water quality programs. For example, there are six water quality management plans that have been certified. These plans interact with Federal, State and local governments in planning, coordinating and monitoring water quality projects. Federal construction grant funds have been utilized for most of the planning, design, and construction of needed municipal wastewater treatment facilities and various phases of sewer projects in Utah. The goals of the construction grants projects municipal wastewater treatment facilities are various phases of sewer projects in Utah. The goals of the construction grants projects are to improve or maintain the water quality of receiving streams and to assure adequate protection of public health.

Industrial wastewater systems have been constructed as a result of the Utah Water Pollution Control Committee regulations and the Federal Clean Water Act. Various municipal, industrial and agriculture facilities have active federal discharge permits (NPDES permits issued by EPA) which are reviewed regularly under the five-year renewal system. Continued sampling of the discharge from these facilities will help enforce the requirements of the NPDES program.

Presently, Salt Lake County is conducting a Nationwide Urban Runoff Program (NURP). Also, the Mountainland Association of Governments is monitoring water quality to determine the effectiveness of implemented Best Management Practices (BMP's) in the Snake Creek Rural Clean Water Project in Wasatch County.

Six counties (Salt Lake, Davis, Weber, Cache, Duchesne and Uintah) are currently involved in wetland programs. These projects include the mapping of wetland areas and the determination of those which are of the greatest value in flood control, urban runoff, wildlife habitat and recreational aesthetics.

Salinity will remain a problem in Utah because of contributions of dissolved solids from natural runoff and agriculture. The State will continue to pursue salinity control activities with the resources available in the Colorado River and Sevier River basins.

The Clean Lakes Inventory and Classification has been completed, covering 127 impoundments in Utah. Three reservoirs, Panguitch, Scofield and Deer Creek, are being studied under current 314 Clean Lakes Grants. Each grant consists of two parts, a diagnostic study and a restoration feasibility study.

SUMMARY OF UTAH'S NONPOINT SOURCE ISSUES

In addressing Utah's NPS issues, careful consideration and distinction of both natural and human caused sources is necessary. Some of the more important natural sources include: sandstone formations in eastern and southern parts of the state; desposits of salts, phosphates, fluorides, nitrates, and arsenic, saline springs, and limestone in shale formations. Resulting water quality impacts include high levels of turbidity, phosphorus, and dissolved and suspended solids. Natural sources are suspected of causing the high mercury levels seen in recent monitoring in the Scofield area. High phenol concentrations found in some streams (such as Cottonwood, Huntington, and Pleasant Valley Creeks) are attributed to either mining or natural causes. The common high intensity, short duration storms help to increase the contribution of natural sources.

The areawide planning agencies have addressed to some extent the control of natural gully and streambank erosion. However, high control costs have limited this effort.

The primary emphasis on NPS control in Utah reflects to sources from several primary types of land uses. Some of the most important include: feedlots (particularly on the middle and lower Bear River and on the Provo River system; oil, gas, and mining activities, livestock grazing, rangeland erosion, irrigation return flows, non-irrigated cropland runoff and erosion, construction, urban runoff particularly along the Wasatch Front, recreation/urban development (such as on the Weber River system), improper functioning of septic systems resulting from poor design and/or location, and silvicultural activities. Water quality impacts from these sources include fecal coliforms, suspended and dissovled solids, possibly phenols from mining, turbidity, salinity, nutrients, and sodium in the Jordan River area, among other parameters.

NPS control is a major component of the State and areawide planning programs. This planning is characterized by extensive reliance on the existing local institutional framework. Some of the primary components of this framework include the soil conservation district, Soil Conservation Service, Agricultural Stabilization and Conservation Service, local Health Department, and local land use planning programs. However, Utah's latest 305(b) Water Quality Report states that there is a "major challenge in developing technologies and institutions to effectively deal with these sources." Efforts continue to assess problems, determine priority areas and solutions, and to refine implementation planning/agreements with management agencies. A major salinity control effort is ongoing. It involves the U.S. Bureau of Reclamation and U.S. Soil Conservation Service among other agencies.

Very limited funding for these local land planning agencies is affected by the level of implementation. In addition, local programs as well as by priorities other than water quality.

WYOMING

Water quality data and inventories for Wyoming are indicative of generally high water quality. For years the State has enjoyed a low density population coupled with little industrial development. However, in recent years, a rapidly growing population associated with energy and mineral development has necessitated intensified efforts to protect valuable water resources.

Of the forty priority water bodies (See Figure #6; Appendix A, Table 6) identified in Wyoming's 305(b) report, only a few can be associated with point source discharge activities. The recreation and aquatic life uses of Goose Creek from the mouth upstream to the Sheridan Sewage Treatment Plant are severely impaired by bacteria and un-ionized ammonia. Data for Clear Creek near Buffalo, Bitter Creek near Powell, Baldwin Creek near Lander and the Belle Fourche River near Hewlett indicate potential aquatic life use impairment from point source discharges of ammonia. Those problems are being addressed primarily through construction grants and NPDES permits.

A majority of the water quality problems in lakes and stream segments are the result of diffuse nonpoint source, or combinations of point and nonpoint sources. Any number of Federal agencies may be involved in management of lands in a particular drainage. In order to address these types of problems, Wyoming cooperates with other State and Federal agencies, and utilizes available resources from a variety of programs to develop comprehensive water quality management plans.

A prime example is Bitter Creek where problems are being addressed through the Construction Grants, Water Quality Management Planning, and NPDES programs. State agencies involved in addition to the Department of Environmental Quality are the Department of Agriculture and the University of Wyoming. Similar cooperative efforts are being utilized in the Fifteen Mile Creek drainage where a number of State and Federal agencies are pooling resources to improve riparian habitat in the drainage. It is anticipated that this same type of cooperative effort will be prerequisite to the solution of eutrophication problems in Flaming Gorge Reservoir, Wyoming's number one priority water body (See Figure 6).

The Flaming Gorge Reservoir, in southwestern Wyoming and northeastern Utah, is considered a priority by EPA and the State of Wyoming because of its importance as a recreational facility, and due to interstate implications with Utah. The southwest Wyoming Water Quality Management Plan, certified by Governor Herschler on March 30, 1980, and conditionally approved by EPA on October 9, 1980 identified Flaming Gorge as a major water quality problem in the State of Wyoming. This finding is supported by the Clean Lakes Inventory.

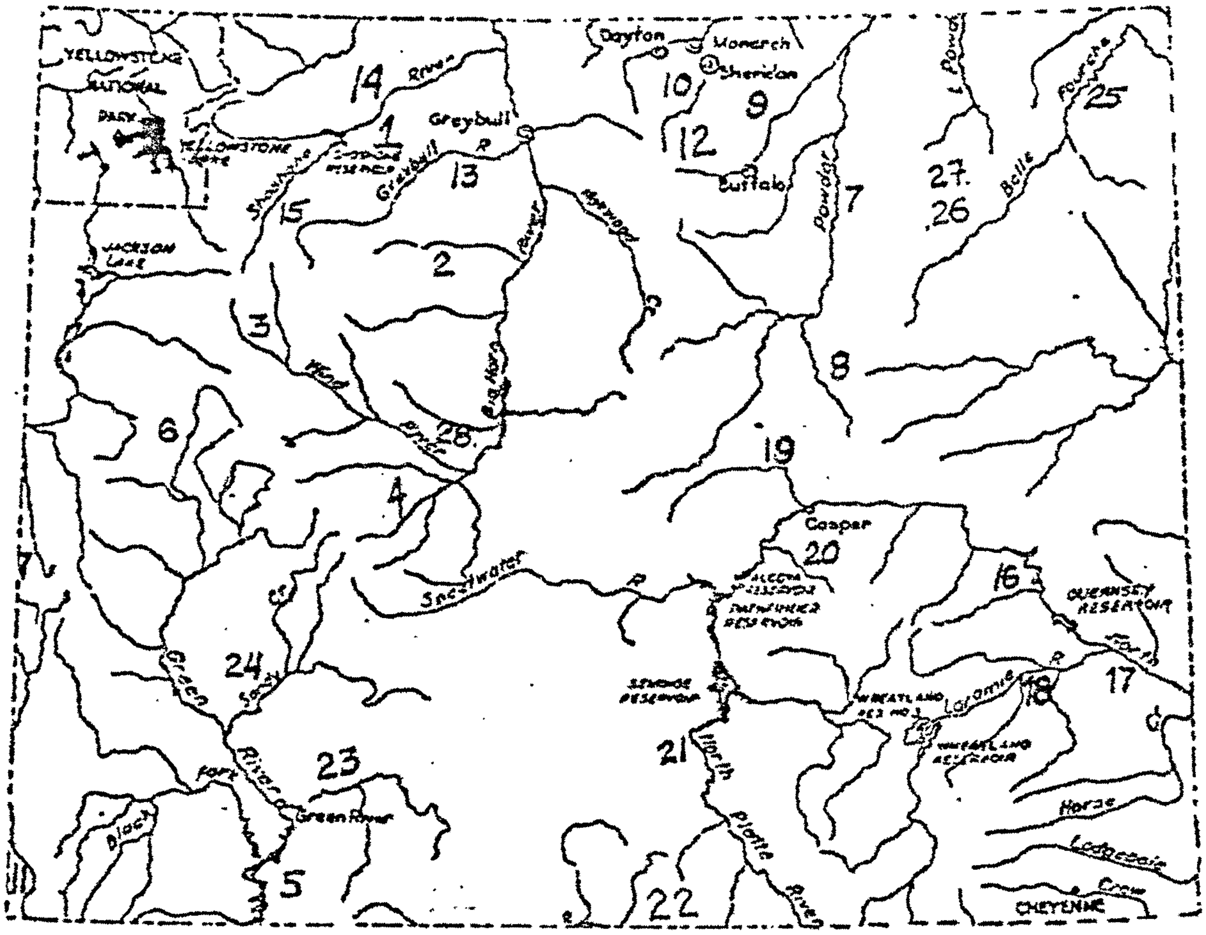


FIGURE 6, WYOMING WATER QUALITY PROBLEM AREAS

1. Shoshone River
2. Fifteen Mile Creek
3. Wind River - Dubois to US Forest Boundary
4. Baldwin Creek
5. Flaming Gorge Reservoir
6. Green River - Daniel to US Forest Boundary
7. Powder River
8. Salt Creek
9. Clear Creek
10. Goose Creek
11. Bear River
12. Little Goose Creek
13. Greybull River
14. Bitter Creek near Powell
15. South Fork Shoshone River
16. Whiskey Gulch
17. North Platte River
18. Rock Creek
19. Casper Creek
20. Bates Creek
21. Sugar Creek
22. Haggerty Creek
23. Bitter Creek
24. Big Sandy River
25. Belle Fourche River
26. Donkey Creek
27. Stonepile Creek
28. Ocean Lake

The reservoir is experiencing accelerated eutrophication which is impairing the cold water fishery, primary and secondary recreation. Natural runoff, mining, grazing, irrigation return flows, urban runoff, construction, and municipal discharges have been identified as possible pollution sources. The principal tributary to this reservoir is the Green River in Wyoming, a drainage under intensive hydrological study for coal and oil-shale extraction and an area undergoing rapid development.

Several Federal agencies (Forest Service, Bureau of Reclamation, BLM) are involved in reservoir operations and adjacent land management activities. Because of the importance of Flaming Gorge as a recreational facility, and interstate implications with Utah, the reservoir is considered a priority by EPA and Wyoming. Western Wyoming College (WWC) Water Quality Laboratory has submitted a project proposal to the Wyoming Water Development Commission. If the project is funded, Wyoming and EPA will cooperate with WWC and will provide technical assistance, as resources allow. EPA will play a key-role in securing cooperation and commitments from Fedeal agencies (BUREC, BLM, USFS, SCS, USFWS) and in resolving interstate issues. If funding is not received for the proposal, this priority issue will be dropped until the necessary resources are obtained.

The Wyoming Department of Environmental Quality, Wyoming Conservation Commission, Bureau of Land Management and University of Wyoming Range Management Division are working together on a five year cooperative watershed study on Fifteen Mile Creek, located near Worland, Wyoming. Fifteen Mile Creek has been identified as a major factor in the deterioration of the water quality of the Big Horn River. This drainage contributes a relatively large portion of the sediment load to the Big Horn River. The cooperative study will be accomplished through agreements and contracts with the above agencies and will include a detailed analysis of the effects of livestock management on riparian zones supported by ephemeral flow along Fifteen Mile Creek. The study will test the effect of such management practices as livestock exclusion, mechanical bank manipulation, seeding, season of grazing use, sediment catchment basins and water spreaders, and stocking rate. Best Management Practices will be developed in relation to grazing riparian zones along ephemeral streams for reducing sediment flow. The study will document a sound basis for management through the programs of BLM, Conservation District, and extension services.

The Urban Storm Water Management Program for Wyoming is centered around the development of storm water quality control plan for highly populated areas within Wyoming. Cheyenne, Casper and Jackson, Wyoming were identified as the target areas. An urban storm water management analysis has been developed for Cheyenne and Casper.

Preliminary work performed as a part of the Teton County Water Quality Program indicated a significant impact upon water quality in Flat Creek due to stormwater runoff from the Town of Jackson. Test samples taken from major storm drain discharges showed high concentrations of total dissolved solids, lead and coliform bacteria, impair the recreational and aesthetic quality of Flat Creek and do harm to aquatic life. At the same time, urban development has continued during the past four years in the Town and County which have contributed an increase in the quantity of stormwater runoff. Consequently, the Teton County Water Quality Plan recommended in 1979 the development of a stormwater master plan to manage stormwater within the Town and County Urban Expansion Area.

The Jackson project was started in 1980. The study focused on four major outputs:

1. The identification of existing water quality problems caused by stormwater runoff within the Town of Jackson and proposed expansion areas.

2. The identification of specific control measures for the Jackson environment to limit the impact of stormwater on water quality and private property.

3. The development of an overall drainage plan with emphasis upon undeveloped areas of the Town and county zoned for urban densities.

4. The development of the necessary legal, institutional and financial mechanisms to implement the proposed stormwater master plan and control measures.

Four sampling stations were set up within the Jackson area. Water quality data was collected for 2 years. DEQ assisted this effort with laboratory analysis. A preliminary draft of the stormwater master plan came out in December 1982. This document is in the final review process. The overall goal of this stormwater master plan is to improve water quality in Flat Creek and its tributaries in conjunction with the increasing land development occurring within the Town and areas immediately adjacent to Town.

APPENDIX A

TABLE I – COLORADO PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	*Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
1) South Platte River Hampden to Platteville	warm water fishery sec. contact recreation public water supply	U-NH_3, FC	Littleton/Englewood WWTP Denver Metro WWTP Brighton WWTP Broomfield/Westminster WWTP	urban runoff	
2) Boulder Creek from Coal creek to St. Vrain Creek	warm water fishery sec. contact recreation	FC, NH_3	Boulder WWTP Louisville WWTP Lafayette WWTP		
3) Clear Creek from Youngfield to mouth	warm water fishery Sec contact recreation public water supply	NH_3, FC	Coors Wheatridge Arvada Clear Creek Valley		
4) Clear Cr. - from Idaho Springs to Youngfield	cold water fishery public water supply	Cu, Zn, Ca		inactive mining	
5) St. Vrain Cr. from Longmont to Mouth	warm water fishery sec. contact recreation	NH_3	Longmont WWTP		
6) Big Thompson River from Loveland to Mouth	warm water fishery sec. contact recreation public water supply	FC, NO_2-NO_3, TDS, TP, SSED	Loveland WWTP		

* [illegible] SEE [illegible]

COLORADO PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use Criteria Public Water Supply Segments Having Levels within 90% of Standards
7) Little Thompson River from Berthoud to Mouth	sec. contact recreation	FC,	Berthoud WWTP		
8) Poudre River from Ft. Collins to Mouth	Sec. contact recreation	FC,	Industrial discharge Eastman Kodak Greeley WWTP Fort Collins WWTP		
9) Arkansas River from I-25 to La Junta	public water supply sec. contact recreation	FC, Zn, TDS, SSED, TP, SO_4, Cu, Pb, Ag, U-NH_3, Cr, Hg, NO_2, DO, Fe	Pueblo WWTP CF&I Steel Rocky Ford WWTP		
10) Arkansas River from La Junta to State Line	warm water fishery sec. contact recreation public water supply agriculture	Zn, TDS, SSED, NO_3, TP, SO_4, FC, Pb		Irrigation returns natural sources	
11) Fountain Cr. from Monument	Public Water Supply	NO_2-NO_3	Colorado Springs WWTP		
2) Uncompahgre iver	Sec. contact recreation	FC	Montrose WWTP Delta WWTP		

COLORADO PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use - Criteria Public Water Supply Segments Having Levels within 90% of Standards
13) Dolores River from confluence with San Miguel to mouth	warm water fishery	U-NH_3, Zn, TDS, TN, TP	Union Carbide		
14) Cherry Cr. Reservoir	sec. contact recreation	FC, NO_2-NO_3		urban runoff	
15) North Fork Bear Cr.	cold water fishery	TP, Cu, Zn, Cd		inactive mining	

TABLE 2: MONTANA PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	* Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
1. Muddy Creek Sev. = 81.24	Aquatic Life Irrigation Public Water Recreation	TSS, N		Irrigated Agriculture Natural Sources Hydrological Modification	
2. High Ore Creek Sev. = 38.18	Aquatic Life	Metals, TSS, pH		Inactive Mining	
3. Silver Bow Creek Sev =24.26	Aquatic Life Irrigation Livestock Watering Recreation	SO_4, TDS, Metals, N, P, pH, BOD	Butte WWTP Mining Industrial Discharge	Mining (Inactive) Urban Runoff	
4. Prickly Pear Creek - below E. Helena Sev. = 20.00	Aquatic Life Irrigation Livestock Watering Public Water Sec. Contact Recreation	Metals, NH_3, FC TSS, N, P	Helena WWTP E. Helena WWTP Industrial Discharge Mining	Inactive Mining Urban Runoff Irrigated Agriculture Grazing Hydrologic Modification	
5. Spring Creek Sev. - 18.22	Aquatic Life Irrigation Livestock Watering Recreation	Metals, TSS, pH, TDS		Inactive Mining	

MONTANA PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
6. Teton River - below Priest Butte Lakes Sev. 8.45	Aquatic Life Irrigation Recreation	TDS, Temperature, TSS		Inactive Mining Hydrological Modification	
7. Ashley Creek Sev. = 5.90	Aquatic Life Recreation	FC, N, P,	Kalispell WWTP	Agriculture On-site Waste Disposal	
8. Beaver Creek - below Bowdoin Sev. = 5.55	Aquatic Life Irrigation Recreation	TDS		Hydrological Modification Natural Sources	
9. East Gallatin River	Aquatic Life Recreation	NH_3, DO, Fec Coli, TSS, N, P			
10. Crow Creek Sev. = 5.47	Aquatic Life Irrigation	TSS, FC, N, P, DO, NH_3	Ronan WWTP	Irrigated Agriculture	
11. Camp Creek Sev. = 5.20	Aquatic Life Irrigation Recreation	FC, TSS		Natural Sources Agriculture Construction	

MONTANA PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Discharges	Non-Point Source Discharges	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
12. Mission Creek Sev. - 5.11	Aquatic Life Irrigation Recreation	TSS, FC, N, P		Irrigated Agriculture	
13. Spring Coulee Sev. - 3.71	Aquatic Life Irrigation	Phenols, TDS	Petroleum (oil and gas) exploration or production		
14. Sage Creek Sev. - 3.58	Aquatic Life Irrigation Livestock Watering Recreation	TSS, TDS			Dryland Agriculture
15. Post Creek Sev. 3.14	Aquatic Life Irrigation Recreation	TSS, FC, N, P			Irrigated Agriculture
16. Grass-hopper Creek below Bannack Sev. - 2.92	Aquatic Life Recreation	Metals, TSS			Inactive Mines Grazing

MONTANA PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Discharges	Non-Point Source Discharges	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
17. Clark Fork River from Warm Springs to Garrison Sev. = 2.41	Aquatic Life Recreation	Metals, N, P, BOD, pH	Anaconda WWTP Butte WWTP Deer Lodge WWTP Warm Springs WWTP	Natural Sources Construction Hydrological Modification	
18. Whitefish River below Whitefish Lake Sev. = 1.57	Aquatic Life Recreation	TSS, N, P	Whitefish WWTP	Irrigated Agriculture Urban Runoff On-Site Domestic Waste Disposal	
19. Jefferson River Sev. = 1.44	Aquatic Life Recreation	Temp., FC, TSS	Whitehall WWTP Three Forks WWTP	Agriculture Irrigated Agriculture	
20. Clark Fork River from Garrison to Bonner Sev. = 1.28	Aquatic Life Recreation	Temp., DO, N, P	Anaconda WWTP Butte WWTP Deer Lodge WWTP Warm Springs WWTP	Natural Sources Construction Hydrological Modification	

MONTANA PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Discharges	Non-Point Source Discharges	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
21. Beaver Creek below Wibaux Sev. - 1.06	Aquatic Life Irrigation Recreation	FC, NH_3, N, P	Wibaux WWTP	On-Site Domestic Waste Disposal	
22. Willow Creek Sev. - 1.04	Aquatic Life Recreation	N, P, NH_3	Browning WWTP		
23. Yellowstone River from Laurel to Custer Sev. = 0.98	Aquatic Life Public Water Supply Recreation	Phenols, Temp., FC, N, P, NH_3, BOD, TSS	Laurel WWTP Billings WWTP Yegen Drain Industrial	Irrigated Agriculture Urban Runoff On-Site Domestic Waste Disposal	
24. Douglas Creek Sev. - 0.91	Aquatic Life Recreation	TSS	Mining (exploration or production)	Construction Grazing	
25. Big Spring Creek Sev. 0.89	Aquatic Life Recreation	N, P, NH_3	Lewistown WWTP		

MONTANA PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Discharges	Non-Point Source Discharges	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
26. Little Peoples Creek Sev. = 0.86	Aquatic Life Livestock Watering Recreation	TSS, Metals, pH	Mining (exploration or production)	Grazing	
27. Beaverhead River below Dillon Sev. = 0.66	Aquatic Life Recreation	Temp., FC	Dillon WWTP	Irrigated Agriculture	
28. Boulder River below Basin Sev. = 0.57	Aquatic Life Recreation	Temp., Fec Coli, Metals, TSS, TDS, N, P	Boulder WWTP	Inactive Mines Hydrological Modification Irrigated Agriculture	
29. Madison River Sev. = 0.57	Aquatic Life Recreation	Temp., As, F, FC	Ennis WWTP	Hydrological Modification Natural Sources (YNP)	
30. Bluewater Creek Sev. = 0.56	Aquatic Life Irrigation Recreation	TSS, N, P		Irrigated Agriculture Hydrological Modification Natural Sources	

MONTANA PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Discharges	Non-Point Source Discharges	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
31. Belt Creek below Dry Fork Sev. = 0.43	Aquatic Life Recreation	Metals, pH, TSS		Agriculture Forest Practices Inactive Mines	
32. Kootenai River below Libby Dam Sev. = 0.39	Aquatic Life Livestock Watering Recreation	Gases, FC	Libby WWTP	Hydrological Modification	

TABLE 3: NORTH DAKOTA PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
1. Souris - River - from confluence with Des Lacs River to confluence with Deep River (Sev. = 0.12)	Warm Water Fishery Recreation	DO, TP, Low Flow	Velva WWTP Towner WWTP Minot WWTP	Natural Sources Non-Irrigated Agriculture Wildlife Refugos	
2. Souris River - from confluence with Deep River to Canadian Border	Warm Water Fishery Recreation	DO, TP, Low Flow		Non-Irrigated Agriculture Waterfowl Concentrations	
3. Red River - from confluence with Sheyenne River to confluence with Turtle River	Warm Water Fishery Recreation Irrigation Public Water Supply Stockwatering	TP, FC, NH_3+ NH_4, Diss Sol., Mg, Mn, TSIN, SSED, Fe, Cu, NH_3, Cl, SO_4, Na, Turb.		Non-Irrigated Agriculture	Irrigation-cond., FC Fe

NORTH DAKOTA PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
4. Red River - from confluence with Wild Rice River to confluence with Sheyenne River	Warm Water Fishery Recreaton Public Water Supply Irrigation	TP, FC, DO, NH_3+NH_4-, U-NH_3, Diss Sol., NH_3	Moorhead WWTP	Non-Irrigated Agriculture Minnesota Sources	Irrigation - Mg
5. Heart River - from Headwaters to confluence with Green River	Warm Water Fishery Public Water Supply Recreation Irrigation Stock Watering	TP, SSED, Fe, Cu, Pb, Zn, Cd, Residue, Diss Sol., Cr, Mn, Ni, Na, SO_4, Diss Na, Be, Na Absorption Ratio	Dickinson WWTP Belfield WWTP	Non-Irrigated Agriculture Natural Sources Low Flows	PWS-SO_4 Stock Watering - Pb

TABLE 4: SOUTH DAKOTA PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

	Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
1	Bad River Headwaters to Missouri River Sev. = 44.56	WW Fishery SCRY Recreation Irrigation	TP, COND, FC, SSED, Temp.,		Grazing Low Flow	
2	Lower Cheyenne River Belle Fourche River to Oahe Dam Sev. 74.60	WW Fishery Pri & SCRY Recreation Irrigation	NO_3, Cr, Hg, Cu, DO, TP, COND, FC, SSED, TDS	Homestake-WWTP St. Regis Paper Whitewood Post & Pole Strawberry Hill Mining Co.	Agriculture Feedlots Grazing Low Flow Natural Erosion	
3	Middle Cheyenne River Angostura Reservoir to Belle Fourche River Sev. = 3.61	WW Fishery Pri & SCRY Recreation Irrigation Livestock Watering	SS, Temp., FC, COND,		Agriculture Livestock Natural Erosion Irrigation Low Flow	
4	Upper Cheyenne River-Wyoming Border to Angostura Reservoir Sev. = 2.00	WW Fishery SCRY Recreation Irrigation	TP, FC, DO, TDS, COND, SSED	Edgemont-WWTP Newcastle, WYO., WWTP	Grazing Low Flow Wyoming Sources Mining Naturally occurring conditions	

SOUTH DAKOTA PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
5 Belle Fourche River from Whitewood Creek to confluence Cheyenne River Sev. = 9.06	WW Fishery Pri & SCRY Recreation Livestock	SSED, FC, TDS CN	Homestake Mining Co.	Agriculture Livestock Low Flow Irrigated Agriculture	
6 Belle Fourche River from WYO. Border to Whitewood Creek Sev. = 1.50	WW Fishery Pri Recreation	SS, FC, NH_3		Unidentified WYO. Sources	
7 Horse Creek from Headwaters to Indian Creek Sev. = 1.33	Livestock	TDS		Irrigated Agriculture	
8 Middle Whitewood Creek Lead to Belle Fourche River Sev. = 83.75	WW & CW Fishery Pri & SCRY Recreation Public Water Supply Irrigation Livestock	Hg, CN, FC, U-NH_3, SSED, As, Cu, Cr, Residue	Whitewood WWTP St. Regis Paper Whitewood Post & Pole Homestake Mining Co. Lead-Deadwood-WWTP Kirk Power Plant Strawberry Hill Mining Co.	Acid Mine Drainage On-Site Direct Discharge Mine tailing Bed Degradation Livestock Storm runoff	

SOUTH DAKOTA PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
9 Grand River Shadehill Reservoir to West Corson County Line Sev. = 1.47	CW Fishery SIRY Recreation	SSED, Temp.		Livestock Agriculture Natural Erosion	
10 South Fork Grand River Sev. = 3.26	WW Fishery SIRY Recreation	TP, COND, FC, SSED		Possible Agriculture Grazing Low Flow	
11 Vermillion River Headwaters to Missouri River Sev. = 1.86	WW Fishery Recreation Sec. Contact	TP, FC, SSED, U-NH_3	Centerville-WWTP Vermillion-WWTP Chancellor-WWTP Howard-WWTP Salem-WWTP	Grazing Feedlots Agriculture Low Flow	
12 Lower James River Milltown to Mayfield Sev. = 0.23	WW Fishery Sec. Contact Recreation	DO, TP, SSED	Scotland-WWTP Menno-WWTP Wolf Creek-WWTP Maxwell Colony-WWTP Parkston-WWTP	Feedlots Runoff from land Application of Whey	

SOUTH DAKOTA PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
13 Upper James River N.D. Border to Huron Sev. = 9.64	WW Fishery Public Water Supply Pri Contact Recreation	DO, TP, TDS, Cd, SSED, Residue, FC, NH_3	Redfield-WWTP Stratford-WWTP Aberdeen-WWTP Huron-WWTP Ashton-WWTP Westport-WWTP Columbia-WWTP	Agriculture Feedlots Grazing Sand Lake Refuge Groundwater In Flow	
14 Turtle Creek Sev. = 7.30	WW Fishery Sec. Contact Recreation Irrigation	DO, FC, NH_3 COND	Redfield-WWTP	Feedlots Agriculture	
15 Keya Paha	WW Fishery Sec. Contact Recreation Public Water Supply	DO, FC, TP, SSED		Preservation stream Livestock	
16 White River N.B. Border to Missouri River Sev. = 20.0	WW Fishery Public Water Supply Pri & SURY Recreation Irrigation Livestock Watering	DO, TP, FC, SSED, NO_3, Cr, Ag, Hg, Cu, Pb, Zn, Cd, Residue, Na, Ar, Ba	~~Ane~~ Pine Ridge-WWTP	Agriculture Grazing Badlands (Natural Sources)	
17 Little White River Headwaters to White Sev. = 2.59	WW Fishery Sec. Contact Recreation Irrigation Livestock Watering	FC, TP, SSED	Martin-WWTP Rosebud-WWTP White River-WWTP	Grazing Agriculture Natural Erosion	

SOUTH DAKOTA PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
18. Missouri River Big Bend Dam to Pierre Sev. = 0.60	Pri Contact Recreation	PA	Pierre WWTP Ft. Pierre WWTP	Unknown Sources	WW Fishery - SSED
19 Missouri River Pierre to ND Sev. = 3.02 below Oahe Dam	CW Aquatic Pri Contact Recreation	SS, Temp.		Bed Degradation Backwater areas Unknown sources	
20 Lower Big Sioux River - Sioux Falls to Missouri River Sev. = 7.20	Warm Water Pri & Sec. Contact Recreation	NO_3, TP, FC, DO, CN, U-NH_3, SSED, COND	Sioux Falls WWTP John Morrell WWTP Brandon WWTP Alcester WWTP Eros Canton Livestock Sales Sioux Falls Stockyards	Agriculture Grazing Urban runoff Construction Feedlots	
21 Upper Big Sioux River Watertown to Sioux Falls Sev. = 1.71	Warm Water Fishery Public Water Supply	NH_3, SSED, Temp., FC, DO, TDS, U-NH_3	Dell Rapids-WWTP Watertown-WWTP Castlewood-WWTP Estelline-WWTP	Grazing Urban runoff Agriculture Lack of Flow	
22 Rapid Creek Dark Canyon to Cheyenne River Sev. = 30.90	CW & WW Fishery Pri & SDRY Recreation Irrigation Livestock	NO_3, U-NH_3, TP, FC, SSED, Temp.	Rapid City-WWTP	Irrigation Feedlots Grazing On-Site Disposal Urban runoff	

SOUTH DAKOTA PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
23 Fall River Headwaters to Cheyenne River	CW & WW Fishery SDRY Recreation	Fe, NO_3, TP, TDS, FC	Hot Springs-WWTP	Warm Water Springs	
24 Moreau River West Dewey County Line to Missouri River Sev. = 11.15	WW Fishery SDRY Recreation Irrigation Livestock	DO, Ammonia, SSED, SAR, DISS, SOLIDS		Low Flow Livestock Natural Erosion Irrigated Agriculture	
25 Moreau River Headwaters to West Dewey County Line Sev. = 6.62	WW Fishery SDRY Recreation Irrigation	SSED, Temp., COND		Livestock Natural Erosion Low Flow	
26 Grand River West Corson County Line to Missouri River Sev. = 2.11	WW Fishery Irrigation	SSED, SAR		Livestock Natural Erosion	

SOUTH DAKOTA PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

	Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
27	Little Minnesota River Sev. = 2.21	Warm Water Fishery Recreation Sec. Contact	DO, SS, FC, NH_3	Sisseton WWTP	Low Flow Livestock	
28	Whetstone River Sev. = 13.07	Warm Water SDRY Recreation	U-NH_3, TKN, FC, DO COND	Milbank WWTP	Low Flow Livestock	
29	South Fork Yellow Bank River Sev. = 0.85	CW Fishery Recreation Sec. Contact	DO, SS, Temp.		Agriculutre Livestock	
30	North Fork Yellow Bank River Sev. = 0.50	Warm Water Fishery SDRY Recreation	DO, Temp.		Agriculture Livestock	
31	Lac Qui Parle (Gary Creek) Sev. = 0.65	CW Fishery SDRY Recreation	SS, FC		Low Flow under Ice Livestock	
32	Missouri River - from Sioux City to Yankton Sev. = 5.96	Warm Water Fishery Public Water Pri Recreation Sec. Contact	SS, FC	Unknown Source in Sioux City Sioux Industry Feedlots	Bed Degradation Bank Erosion Agriculture	

TABLE 5: UTAH PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	* Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use - Criteria Public Waters Supply Segments Having levels within 90% of Standards
1) Weber River tributaries from Stoddard Diversion to headwaters Serv.= 32.55	C.W. Fishery irrigation livestock watering	TN, Hg, Cu, SSED, DO, B, CN, NH_3-N, Turb, TSIN, TC	(Park City) Recreation Development, Ideal Cement, Kamas Fish Hatchery, Oakley Lagoons, Kamas, Lagoons, Sanderville WWTP Coalville WWTP Morgan Lagoons Henefer Lagoons Central Weber WWTP	upstream conditions hydrologic modification, livestock grazing, urban runoff, irrigated agriculture, mining, energy exploration	
2) Provo River and tributaries from Murdock Diversion to headwaters Sev.=6.02	C.W. Fishery Public Water Supply sec. contact recreation livestock watering irrigation	Mn, TC, Ni, FC, TSIN, Turb	Heber Valley WWTP Midway WWTP feedlots	agriculture irrigated cropland nonirrigated cropland fish hatcheries	PWS - Mn C.W. Fishery - IP sec. contact recreation - IP
3) Jordan River North Temple St to confluence w/ Little Cottonwood Cr. Sev.= 2.96	sec. contact recreation W.W. Fishery irrigation	TN, DO, FC, SO_4, Hg	Murray WWTP Cottonwood WWTP Granger-Hunter WWTP SLC suburban WWTP #1 So. SLC WWTP Central Valley WWTP feedlots	urban runoff natural source upstream conditions (Utah Lake) irrigated agriculture construction industrial hydrologic modification	

FOR EXPAND... TABLE 4.

UTAH PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use - Criteria Public Water Supply Segments Having Levels within 90% of Standards
4) Jordan River from confluence w/ Little Cottonwood Cr. to Narrows Diversion Sev.= 9.16	sec. contact recreation C.W. Fishery irrigation	TP, TC, FC, BOD, DO, Hg, Temp, TDS, TH	feedlots South Valley WWTP Midvale WWTP Sandy WWTP	urban runofft. natural source upstream conditions (Utah Lake) irrigated agriculture construction hydrological modification	
5) Bear River (Cache Co.) Sev.= 6.98	W.W. Fishery irrigation	TP, BOD, TDS	Smithfield WWTP	irrigated agriculture dairies feedlots natural source Idaho upstream -contributions hydrological modifications	
6) Price River Blue Cut Diversion to headwaters Pleasant Cr. to headwaters Sev.= 42.56	public water supply irrigation	TDS, TP, FC, Hg.	Kenilworth WWTP Price WWTP	natural source on-site disposal construction mining grazing livestock irrigated agriculture	
7) Provo River + tributaries from Utah Lake to Murdock Diversion Sev.= 2.24	C.W. Fishery sec. contact re- livestock watering irrigation	TP		urban runoff agriculture grazing irrigated cropland septic tanks	

UTAH PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use - Criteria Public Water Supply Segments Having Levels within 90% of Standards
8) Weber River Slaterville Diversion to Stoddard Diversion Sev.= 2.24	C.W. Fishery irrigation	TP, B, TSIN, Turb	Mountain Green WWTP	urban runoff hydrological modifications, upstream conditions, construction, livestock irrigated agriculture non-irrigated cropland	
9) Price River & tributaries from confluence w/ Green River to Castle Gate below Price WWTP Sev.= 7.83	W.W. Fishery irrigation livestock watering	TDS, Na	Price WWTP	grazing irrigation mining	
10) Duchesne & tributaries from Myton WWTP intake to headwaters Sev.= 17.09	C.W. Fishery public water supply	Turb, residue, Mn, Na, B, TDS, SO_4, Ni, TP	Myton WWTP Lagoon Duchesne WWTP Lagoon	agriculture irrigated cropland oil, gas, hydrologic modification, mining	Public Water Supply, Mn, Ni, Residue, TSIN C.W. Fishery - Temp, TSIN
11) Little Bear River from Cutler Reservoir to headwaters Sev.= 0.73	C.W. Fishery irrigation	Turb, TP, Temp, TSIN	Hyrum WWTP White Trout Farms feedlots dairies	non-irrigated cropland irrigated agriculture grazing natural source hydrologic modification	

UTAH PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use - Criteria Public Water Supply Segments Having Levels within 90% of Standards
12) Sevier River from Gunnison Bend Reservoir Innabella Diversion Sev.= 12.60	W.W. Fishery irrigation	Turb NO_3, TP, Cu, TDS, TSIN, Fe	Richfield WWTP Salina WWTP feedlots	irrigated agriculture grazing natural source hydrological modification	
13) Big Cottonwood Cr., Little Cottonwood Cr., Mill Cr. Sev.= 53.11	sec. contact re- C.W. Fishery irrigation	TP, BOD, TC, BOD	Salt Lake CO./Cottonwood WWTP, Central Valley WWTP (potential discharge to Mill Cr.)	urban runoff hydrological modification construction irrigated agriculture upstream conditions mining	
14) Fremont River thru Capitol Reef National Monument to headwaters Sev.= 1.34	W.W. Fishery irrigation livestock	TDS, Na	J.P. Egan Fish Hatchery LOA Fish Hatchery	natural sources irrigated agriculture	
15) Bear River and tributaries (Rich Co.) Sev.= 7.10	C.W. Fishery public water supply pri. & sec. recreation, irrigation livestock	TSIN, TP, Turb, TC, Mn, Ni, Temp, NO_3-N, DO, NO_3, Fe, Na	Evanston, WY WWTP	natural sources agriculture, non-irrigated cropland grazing, energy exploration and development of overthrust belt	C.W. Fishery - Temp, DO

UTAH PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use - Criteria Public Water Supply Segments Having Levels within 90% of Standards
16) Virgin River and tributaries from UT-AZ State Line to headwaters Sev.= 6.36	W.W. Fishery irrigation livestock	TDS, Na, B	St. George WWTP Washington & Hurricane Lagoons	natural sources irrigated agriculture grazing, recreational development	
17) Cub River and tributaries from confluence with Bear River to UT-ID State Line Sev.= 1.80	W.W. Fishery irrigation livestock	DO, NO_3, TP	Western Dairymen feedlots	irrigated agriculture non-irrigated cropland upstream Idaho contributions	
18) Spanish Fork River and tributaries from Utah Lake to diversion at Moark Jct. including Benjamin Slough and Beer Cr. Sev.= 0.90	W.W. Fishery irrigation livestock waterking waterfowl	TP, BOD, u-NH_3, TDS TSIN, Turb	Payson WWTP Salem WWTP	irrigated agriculture grazing natural source on-site disposal livestock septic tanks hydrologic modification non-irrigated cropland feedlots	

UTAH PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use - Criteria Public Water Supply Segments Having Levels within 90% of Standards
19) San Rafael River from confluence w/ Green River to confluence w/ Ferron Cr. Sev.= 8.97	W.W. Fishery Irrigation livestock	TDS, Na		natural sources mining grazing	
20) Sevier River Annabelle Diversion to headwaters ~~reservoir~~ ev.= 11.32	C.W. Fishery Irrigation livestock watering	Turb, TP, H_g, Temp Cu, DO	Panguitch WWTP	irrigated agriculture grazing, livestock, construction, natural source, upstream conditions, hydrologic modification, non-irrigated cropland	
1) Jordan iver Farming-n Bay-North mple Street v.= 6.03	sec. contact recreation irrigation non-game fishery	TN, TP, DO, TC, TDS, FC	South David WWTP feedlots	urban runoff national sources construction industrial hydrologic modifications upstream conditions (Utah Lake)	

TABLE 6: WYOMING PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	* Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
1. Shoshone River from Big Horn Reservoir to Buffalo Bill Dam	CW Fishery Public Water Supply	SO_4, TDS, SSED	Will Wood Dam Oil treater discharges	Natural Runoff Irrigated return flows	
2. Fifteen Mile Creek - entire length	Sec. Contact Recreation	SSED, Fec Coli, TP TN, TDS		Grazing Natural Erosion	
3. Wind River - Dubois to US Forest Service boundary	CW Fishery	Stream Channel Alteration	N/A		
4. Baldwin Creek	CW Fishery Sec. Contact Recreation	DO, NH_3, Fec Coli	Lander STP		
5. Flaming Gorge Reservoir	CW Fishery Pri. Contact Recreation	P	Green River WWTP Rock Springs WWTP	Natural Runoff Urban Runoff	

* [illegible] TABLE 5

WYOMING PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
6. Green River - from Daniel upstream to US Forest Service boundary	Cold Water Fishery	Stream Channel Alteration	N/A		
7. Powder River - entire length in Wyoming	Warm Water Fishery Irrigation CW Fishery	Sed, TDS, Turb.	oil treater discharges	Erosion, grazing, Runoff from saline soils	
8 Salt Creek	Irrigation (from the Powder River)	TDS	oil treater discharges	Runoff from saline soils	
9. Clear Creek - from its mouth upstream to the Buffalo STP	CW Fishery Sec Recreation	DO, FC, NH_3, Temp.	Buffalo WWTP Various Satellite facilities	Irrigation Diversions causing low flows and increased temperatures	CW Fishery - Temperature
10. Goose Creek - from mouth upstream to Sheridan STP	CW Fishery Pri. Contact Recreation	NH_3, Cyanide, Iron, Fec Coli, Turb.	Sheridan STP - NH_3 & Fec Coli	Natural Background Fe & Cyanide	
11 Bear River - from Woodruff Narrows Res to Evanston	CW Fishery Sec. Contact Recreation	NH_3, Dewatering, FC	Evanston WWTP Satellite Treatment Plants	Hydrologic Modifications Irrigation Diversions	

WYOMING PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
12 Little Goose Creek - from mouth upstream through the town of Big Horn	CW Fishery Sec. Contact Recreation	Temp., Sed., Turb., Low flows, loss of Riparian Vegetation	Corral & Feedlot Runoff Septic	Irrigation Diversions Return Flows Access to stream by stock	
13 Greybull River from its mouth to Meeteet-see STP	CW Fishery Sec. Contact Recreation	FC, Sed., Dewatering	Meeteetsee STP	Irrigation with-drawals return flows	
14 Bitter Creek near Powell	CW Fishery Sec. Contact Recreation	SSED, TP, TN, TDS, SO_4, Fec Coli, NH_3 Turb.	Powell STP, Feedlot, Failing Septic Tanks	Irrigation return flows Natural Sources	
15 South Fork Shoshone River from Bubbalo Bill Reservoir to the US Forest Service boundary	CW Fishery	Dewatering Habitat Destruction		Irrigation Diversions Stream bank and channel modification	

WYOMING PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

	Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
16	Whiskey Gulch - from Guernsey Reservoir to Glendo STP	Sec. Contact Recreation Pri. Contact Recreation Guernsey Reservoir	Fec Coli	Glendo STP		
17	North Platte River from Nebraska state line to Guernsey Dam	CW Fishery	SSED Dewatering	Deliberate flushing of silt from Guernsey Reservoir		
18	Rock Creek - from mouth to Wheatland	CW Fishery	NH_3, DO	Wheatland STP		
19	Casper Creek	Sec. Contact Recreation	Fec Coli	Mills STP		
20	Bates Creek	CW Fishery	Sed.		Grazing Natural Erosion	
21	Sugar Creek	Sec. Contact Recreation	Fec Coli	Sinclair STP		

WYOMING PRIORITY STREAM SEGMENTS AND IMPAIRED BENEFICIAL USE

	Stream Segment	Use Impaired	Problem Parameters	Point Source Dischargers	Non-Point Source Dischargers	Beneficial Use-Criteria Public Water Supply Segments Having Levels within 90% of Standards
22.	Haggerty Creek	Cold Water Fishery	Cu	Abandoned copper mine - Dos Lomas		
23.	Bitter Creek	Sec. Contract Recreation	Fec Coli	Rock Springs STP		
24.	Big Sandy River	Public Water Irrigation	TDS, SO_4	Big Sandy Reservoir see page	Irrigation return flow	
25.	Belle Fourche River from mouth of Sourdough Creek to Hulett STP	Warm Water Fishery See Contact Recreation	DO, Fe, NH_3, Turb., Fec Coli	Hulett STP	Natural Background Fe	
26	Donkey Creek	Warm Water Fishery Sec. Contact Recreation	Fe, FC, DO	Gillette STP Various satellite facilities in Gillette area	Natural Background Fe	
27.	Stonepile Creek	Sec. Contact Recreation	FC	Gillette STP		
28.	Ocean Lake	Warm Water Fishery	SSED, Nutrients		Irrigation Return Flows	

KEY TO PROBLEM PARAMETERS

Ag - Silver	As - Arsenic	B - Boron
Be - Berylium	Cd - Cadmium	Cl - Chlorine
Cr - Chromium	Cu - Copper	Diss Sol - Dissolved Solids
DO - Dissolved Oxygen	Fe - Iron	Fl - Fluorine
FC - Fecal Coliform	Mn - Manganese	Mg - Magnesium
N - Nitrogen	Na - Sodium	Ni - Nickel
NH_3 - Un-ionized Ammonia	NH_3-NH_4+ - Total Ammonia	P - Phosphorus
Pb - Lead	SO_4 - Sulfate	
SSED - Suspended Sediment	TC - Total Coliform	TDS - Total Dissolved Solids
TSIN - Total Soluble Inorganic	TSS - Total Suspended Solids	Turb - Turbidity
U-NH_3 - Un-ionized Ammonia		

The Statewide Water Quality Management Plan and the areawide plans identified a need to develop a Statewide program for the management and control of on-site wastewater systems. The water quality plan identified a number of water quality problems as well as financial and institutional deficiencies with the present program. The present program was evaluated in detail in a study entitled "Managing On-site Wastewater Systems In Wyoming, Financial and Institutional Needs and Recommendations." This report identified a number of major issues and alternative institutional arrangements for dealing with the issues. The major conclusion of the report is that responsibility for this program should be delegated to local governments with the State role one of technical and financial support and assistance.

The 1982 Wyoming Legislature revised the Wyoming Environmental Quality Act to allow for delegation to locate entities certain programs, including on-site system review and approval. The Division has developed rules and regulations to implement delegation of the program. They are currently in the review process.

APPENDIX B.

B-1: IMPLICATIONS TO WATER QUALITY MANAGEMENT PROBLEMS

WATER RESOURCES DEVELOPMENT IN REGION VIII

Water scarcity in the western United States results in competing uses for available water. Increased demand from agriculture, municipal and energy interest have created substantial uncertainty over how supplies will be used. Water conservation and reuse are alternatives to developing new supplies or extending existing supplies to meet increasing demands.

Past approaches to water resources planning and development and water allocation systems have favored out-of-stream uses such as irrigation, over the values associated with instream uses such as aesthetics and recreation. Flow depletions, resulting from out-of-stream uses, can severely affect water quality, fish and wildlife resources, recreation, aesthetics, water supply, hydropower production and navigation. A number of States in Region VIII have identified flow depletions as a major water quality problem.

In recent years there has been increasing recognition by state legislatures of the many benefits associated with the protection and maintenance of instream flows. The Environmental Protection Agency's concerns regarding instream flow issues stem from the objectives of the Clean Water Act i.e. attaining the Act's "fishable and swimmable" goal by 1983. For example, there are sizeable public and private investments in wastewater treatment facilities that are designed for given flow conditions. Further depletions of flow will result in substantial added public and private costs and adverse environmental impacts.

Region VIII will be the focal point for energy resource development for the Nation in the 1980's and beyond. Coal, oil shale, unconventional gas, tar sands, synthetic fuels, and uranium are predominantly located in the western states.

Depending on the technologies and sites chosen, western energy resources development may create local and possible regional water shortages. On a basin-wide level, the most severe problems are likely to occur in the Upper Colorado River Basin. Where energy requirements for water are added to non-energy requirements for the year 2000, the total may exceed the amount of available water by as much as one million acre-feet per year. Each incremental use threatens to worsen the overall salinity problems now facing the Colorado River Basin streams.

Most or all of the water resources of the western states are close to being fully appropriated. The West is also experiencing very rapid population growth that must compete for scarce water resources. Agriculture is still expanding in areas of the West. What can and will result then, is that these three water uses -- agriculture, municipal, and energy-industrial -- will compete for what unused resources still remain. Agriculture, the biggest user and consumer of water, is bound to be adversely affected.

The proliferation of on-stream reservoirs to meet water demands will significantly modify the chemical, physical, geological and biological features of the freshwater river systems of the West. The impacts of these alterations are often felt well beyond the project site. Substantial downstream changes in water quality frequently accompany reservoir construction and operation. Biological responses to these modifications are variable and frequently site specific. Slight to moderate or substantial shifts in aquatic community structures and functions may occur. In some cases entire populations of fish and the aquatic organisms have been eliminated. The type and degree of downstream modification are influenced by factors such as the water quality characteristics of the water flowing into the reservoir; the biological, hydrological and geochemical features of the reservoir; and the local climate and geographical characteristics. The manner in which the reservoir and the surrounding and upstream lands are managed is critical to in-reservoir and downstream water quality.

B-2: Point Source Dischargers to Priority Stream Segments

UTAH

Stream Segment with Impaired Use	Point Source Discharger	NPDES Compliance Status
1. Weber River and tributaries from Stoddard ~~Diversion~~ to Headwaters	Park City Recreation ~~Development~~	C
	Ideal Cement	C
	Kamas Fish Hatchery	
	Oakley Lagoons	
	Kamas Lagoons	
	Snyderville WWTP	
	Coalville WWTP	
	Morgan Lagoons	C
	~~Henefer Lagoons~~	
	Central Lagoons	
2. Provo River and tributaries from Murdock Diversion to headwaters		
3. Jordan River from North Temple St. to confluence with Little Cottonwood Creek	Murray WWTP	C
	Cottonwood WWTP	C (violating permit but in compliance with order)

UTAH

Stream Segment with Impaired Use	Point Source Discharger	NPDES Compliance Status
	Granger-Hunter WWTP	C
	South SLC WWTP	C
4. Jordan River from confluence with Little Cottonwood Creek to Narrows Diversion	Midvale WWTP Sandy WWTP	NC (TC) NC (TSS)
5. Price River from Blue Cut Diversion to headwaters, and Pleasant Creek to headwters	Price WWTP	NC (TC, FC)
6. Weber River from Slaterville Diversion to Stoddard Diversion		
7. Price River and tributaries from confluence with Green River to Castle Gate below Price WTP	Price WWTP	NC (TC, FC)

Point Source Dischargers to Priority Stream Segments

UTAH

Stream Segment with Impaired Use	Point Source Discharger	NPDES Compliance Status
8. Duchesne River and tributaries from Myton WTP intake to headwaters	Myton WWTP Lagoon Duchesne WWTP Lagoon	 C
9. Little Bear River from Cutler Reservoir to headwaters	White Trout Farms	
10. Sevier River from Gunnison Bend Reservoir to Annabella Diversion	Richfield WWTP Salina WWTP	NC (TC, FC) C
11. Big Cottonwood Creek, Little Cottonwood Creek, Mill Creek	Salt Lake Co/Cottonwood WWTP Central Valley WWTP	C (in violation of permit but in compliance with Order
12. Fremont River through Capital Reef National Monument to headwaters	J.P. Egan Fish Hatchery LOA Fish Hatchery	

Point Source Dischargers to Priority Stream Segments

UTAH

Stream Segment with Impaired Use	Point Source Discharger	NPDES Compliance Status
13. Bear River and tributaries from Woodruff Reservoir to WY/UT State Line	Evanston, WY-WWTP	
14. Virgin River and tributaries from UT-AZ State line to headwaters	St. George WWTP Washington & Hurricane Lagoons	C
15. Cub River and tributaries from confluence with Bear River to UT-ID State Line	Western Dairymen	C
16. Spanish Fork River and tributaries from Utah Lake to diversion at Moark Jct., including Benjamin Slough and Beer Creek	Payson WWTP Salem WWTP	C C
17. Sevier River from Annabelle Diversion to headwaters	Panguitch WWTP	

Point Source Dischargers to Priority Stream Segments

UTAH

Stream Segment with Impaired Use	Point Source Discharger	NPDES Compliance Status
18. Jordan River from Farmington Bay to North Temple Street, SLC	South Davis WWTP	C
19. East Canyon Creek	Snyderville WWTP	
20. Ashley Creek from mouth to Vernal	Vernal WWTP	NC
21. San Pitch River from mouth to Ut Hwy 132	Ephraim Lagoons	
22. Bear River (Box Elder Co.)	Brigham City WWTP	NC
	Corinne Lagoons	

Point Source Dischargers to Priority Stream Segments

WYOMING

Stream Segment with Impaired Use	Point Source Discharger	NPDES Compliance Status
1. Shoshone River from Big Horn Reservoir to Buffalo Bill Dam	Will Wood Dam	
2. Baldwin Creek	Lander STP	C
3. Clear Creek - from mouth upstream to the Buffalo STP	Buffalo WWTP	C
4. Goose Creek from mouth upstream to Sheridan STP	Sheridan WWTP	C
5. Bear River from Woodruff Narrows Reservoir to Evanston	Evanston WWTP	NC (BOD_5, TSS)
6. Greybull River from mouth to Meeteetsee STP	Meeteetsee STP	-
7. Bitter Creek near Powell	Powell WWTP	C
8. Whiskey Gulch from Guernsey Reservoir to Glend STP	Glendo STP	
9. North Platte River from NEB state line to Guernsey	Guernsey Reservoir	

WYOMING

Stream Segment with Impaired Use	Point Source Discharger	NPDES Compliance Status
10. Rock Creek from mouth to Wheatland	Wheatland WWTP	
~~11. Casper Creek~~	~~Mills WWTP~~	
12. Sugar Creek	Sinclair WWTP	
13. Bitter Creek	Rock Springs WWTP	NC (Cl_2)
14. Big Sandy River	Big Sandy Reservoir	
15. Belle Fourche River from mouth of Sourdough Creek to Hulett WWTP	Hulett WWTP	C (marginal)
16. Donkey Creek	Gillette WWTP	NC (BOD_5, TSS)
17. Stonepile Creek	Gillette WWTP	NC (BOD_5, TSS)

Trend analyses per se, have not been attempted for these same reasons. Water quality in Region VIII streams is highly correlated with seasonal fluctuations in the natural hydrologic cycle. High streamflows are associated with naturally large concentrations of sediment and high turbidity; low streamflows are associated with larger concentrations of dissolved materials and lower turbidity. If year-to-year water quality samples are not taken during comparable times in the hydrologic cycle - which is often the case - then the apparent water quality trend will be an artifact of sample timing, and the true trend will remain unknown. Even if year-to-year samples are taken from comparable points on the hydrologic cycle, there will be differences in streamflow, which must be factored into the quality analysis. In may cases, streamflow information is not available to statistically weight streamflows to arrive at a true and reliable assessment of water quality trends. Region VIII is, however, developing a procedure to flow-weight water quality data.

Of these problems, the most serious impediment to severity and trend analysis is the scarcity of regular monitoring data from apparent and potential problems segments. Because of the great expense involved in monitoring, only the Federal government can afford to do the bulk of the water quality monitoring in Region VIII. The Federal monitoring network has been geared largely to energy impact areas and to national trend monitoring. Hence, the stations tend to be project specific or on the larger rivers where pollutants are more readily diluted and where pollution sources are obscure and problematic. The most significant data gap in Region VIII is biological; biological data is virtually absent. This deficiency will greatly hinder Region VIII's ability to develop site-specific water quality standards recommendations.

Aquatic life protection uses and recreational water uses are the uses most frequently impaired by pollution in Region VIII. To a lesser extent, water classified for public water supply protection and for agricultural use are also impaired.

Un-ionized ammonia, low dissolved oxygen and elevated nutrients are the parameters associated with municipal wastewater treatment facilities which appear to be having the greatest effect on aquatic life. Cadmium, copper, lead and zinc contamination from active, inactive or abandoned mining operations are suspected of having severe effects on aquatic life.

Nonpoint source pollution constitutes, by in large, the principal cause of the water quality problems in Region VIII, with some states reporting that over 90% of their water quality problems are due to natural and human-induced nonpoint source pollution. Sediment, nutrients and salinity are the parameters which are responsible for most of the use impairment observed in Region VIII. Fecal coliform from nonpoint sources and inadequately treated wastewater cause frequent recreational use impairments.

Some of the more signigicant water quality problems in Region VIII remain unresolved. These problems are being addressed through programs such as:

- Upper Colorado River Basin Salinity Control Program
- Water Quality Standards (use attainability & site-specific criteria)
- NPDES Discharge Permits
- Wetlands and 404 Permits
- Clean Lakes Programs
- Nationwide Urban Runoff Program
- Construction Grants Program
- Continuing Planning Process
- Agricultural Conservation Program (Dept. of Agriculture)

PART II: REGIONAL OVERVIEW OF WATER QUALITY ISSUES - SIGNIFICANT WATER QUALITY PROBLEMS

COLORADO

The thrust of the Federal Clean Water Act is to restore and maintain the quality of the nation's waters. Thus, impaired stream segments in Colorado reflect those areas where stream segments have not yet achieved the use or quality deemed advisable and desirable by the State and EPA. (See Figure #1 Colorado Map; Table 1.)

The most significant water quality impairments in Colorado are due to fecal coliforms and/or ammonia. Discharges from municipal wastewater facilities are the primary cause of the impairments. Both recreational uses and aquatic life are affected.

Segment 10 of Boulder Creek is the only Class II recreational water body in Colorado not consistently meeting its adopted standard for fecal coliform. The data indicates that Boulder Creek would also frequently have a problem meeting the criterion for a Class II recreational stream. The station evaluated on Boulder Creek is downstream from the City of Boulder and from the confluence with Coal Creek. There is one municipal discharge to Boulder Creek and three discharges to Coal Creek. Earlier studies by the Division have indicated that Coal Creek is a major source of degradation to water quality in Boulder Creek. Only the town of Erie was significantly out of compliance with their discharge permit limits for fecal coliforms during the evaluation period.

All of the stream segments impaired because of fecal coliforms are in areas of intensive agricultural land use and are downstream of major municipal point source discharges. Many of the municipal dischargers to impaired segments commonly have had a problem in meeting their permit limits for fecal coliforms during the evaluation period.

Concentrations of un-ionized ammonia impaired both Class I and Class II aquatic life streams. With the exception of the Dolores River below the confluence with the San Miguel River, the primary source of ammonia is municipal wastewater. Water quality standards allow higher concentrations of ammonia in the San Miguel River below Uravan than are allowed in the Dolores; however, the ammonia load from the San Miguel causes the Dolores to exceed its adopted standard.

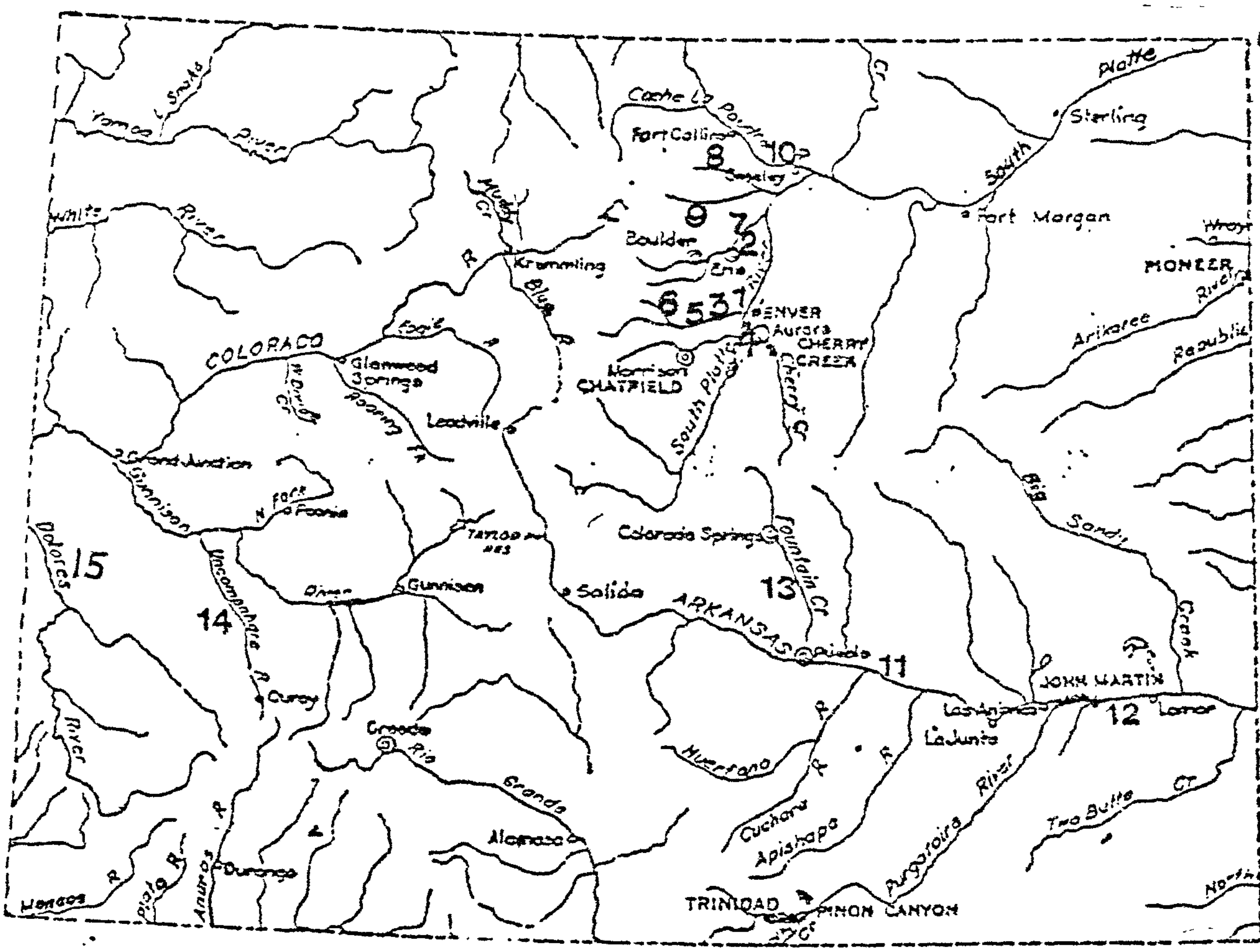


FIGURE 3. COLORADO WATER QUALITY PROBLEM AREAS

1 - South Platte River (Hampden to Henderson)
2 - Boulder Creek (Coal Creek to St. Vrain Creek)
3 - Clear Creek (Youngfield to mouth)
4 - Cherry Creek Reservoir
5 - Clear Creek (Idaho Springs to Youngfield)
6 - North Fork Clear Creek
7 - St. Vrain Creek (Longmont to mouth)
8 - Big Thompson River (Loveland to mouth)
9 - Little Thompson River (Berthoud to mouth)
10 - Poudre River (Ft. Collins to mouth)
11 - Arkansas River (I-25 to La Junta)
12 - Arkansas River (La Junta to Stateline)
13 - Fountain Creek (Monument Creek to mouth)
14 - Uncompahgre River
15 - Dolores River (San Miguel River to mouth)

Gore Creek, the Crystal River, and the North Fork of the Gunnison have Class I aquatic life designations and have experienced ammonia problems during the evaluation period. Since there are no municipal point source discharges to the Crystal River the source of ammonia is unknown. Ammonia exceedance on Gore Creek occurred downstream of a major municipal discharger that was experiencing operational problems during the time of peak winter recreational use in the evaluation period. A fish hatchery, a dairy, and several small municipalities discharge to the North Fork. Any or all of these sources could have contributed to the problem on the North Fork.

The major un-ionized ammonia concerns in Colorado occur on the South Platte River from near Bowles Avenue in the Metro Denver area to approximately Platteville, Clear Creek below Youngfield Street, the St. Vrain River below Longmont, and Boulder Creek below Boulder. All four stream segments violate their un-ionized ammonia standard on a low to moderate frequency rate. The watersheds of all four of these streams are expected to encounter major population increases during the next twenty years. Therefore, without proper measures, both the frequency and the magnitude of the violations may increase in the future.

Many of the remaining stream impairments in Colorado are due to several heavy metals (lead, cadmium, copper, zinc,) which exceed the standards established for cold water aquatic life. With the exception of Ten Mile Creek in Summit County, reductions in concentrations of these metals may be contingent upon the control of drainage from inactive or abandoned mine tails or tunnels. The Molybdenum mine at Climax is the major point source discharge to Ten Mile Creek. Seasonal standards for metals have set for Ten Mile Creek which will protect the established aquatic life between Copper Mountain and Dillon Reservoir. Metals which are associated with present or past mining activities or natural geologic conditions, have impaired only aquatic life with the single exception of the Eagle River. The utility of the Eagle River for municipal purposes has been significantly diminished because of the concentration of manganese which exceeds the adopted standards for water supply.

A study published in 1974 by the U.S. Geological Survey identified 450 stream miles in Colorado that had been impacted by metal mine drainage. Water quality impairment was attributed to ongoing, as well as past mining operations and natural mineral seeps. Damage to the aquatic environment was caused by a number of factors including flow from drainage tunnels, milling operations, and tailings piles. Restoration of several segments owing to the control of point source discharges at active locations or to the clean up of inactive mine areas has been accomplished. Feasibility studies are under way at several other locations in order to take advantage of reclamation funds that may become available in the future.

MONTANA

The most significant water quality problems in Montana are sediment, salinity and problems arising from water depletion. A recent effort was made to identify and prioritize Montana problem stream segments. A total of 216 stream segments were identified as problem segments (See Appendix A, Table 2). Sufficient recent data was only available, however, to develop pollution severity indices for 99 of these segments. Thirty-two of these problem segments were judged to be largely man caused and improvable under existing regulatory authority and pollution control programs. These 32 segments form Montana's priority waterbodies list upon which regulatory and planning efforts are focused.

During the past two years Montana's surface water quality standards have been revised. Policies for establishing permit levels for ammonia, chlorine residuals, and oil and grease have been modified. This includes eliminating the need to chlorinate many wastewater treatment plant effluents during winter months. New rules to implement the State's nondegradation law have been prepared. Developments are routinely reviewed and monitored for potential impacts to water quality. These include lakeshore subdivisions, new and modified hydroelectric and other energy projects, new and modified mining developments and new discharges.

It is estimated that over $50 million worth of work needs to be done to upgrade Montana's wastewater treatment facilities. Montana's major wastewater treatment funding needs should be met, however, if all construction grant funds currently authorized through FY 1985 are appropriated by Congress. During the last two years, more than $38 million has been provided to local governments for the construction of wastewater treatment facilities to improve water quality and protect public health. Studies are continuing to identify water quality problems attributable to wastewater treatment discharges. It is estimated that eight municipal treatment plans are causing some degree of ammonia toxicity to aquatic life in streams receiving the discharges. Mining and milling activities and petroleum refining activities provide the more significant industrial point source discharges in the State.

Most of Montana's water quality problems result from nonpoint sources of pollution. Agricultural, mining, and forestry related activities are the principal land use practices which impact Montana water quality. This includes; acid mine drainage and toxic metal contamination from mining activities; accelerated erosion and stream sedimentation from hydrologic modifications and improper land management; and excess sediment, nutrients, pesticides and other contaminants from runoff. Planning, technical assistance, and educational efforts which define and disseminate information on the relation of land use to water quality have been the chief mechanism used to address these nonpoint pollution problems. Sharing in these efforts are the Water Quality Bureau, one of the four original areawide planning organizations, several Indian tribes, and a host of local, State and Federal governmental agencies.

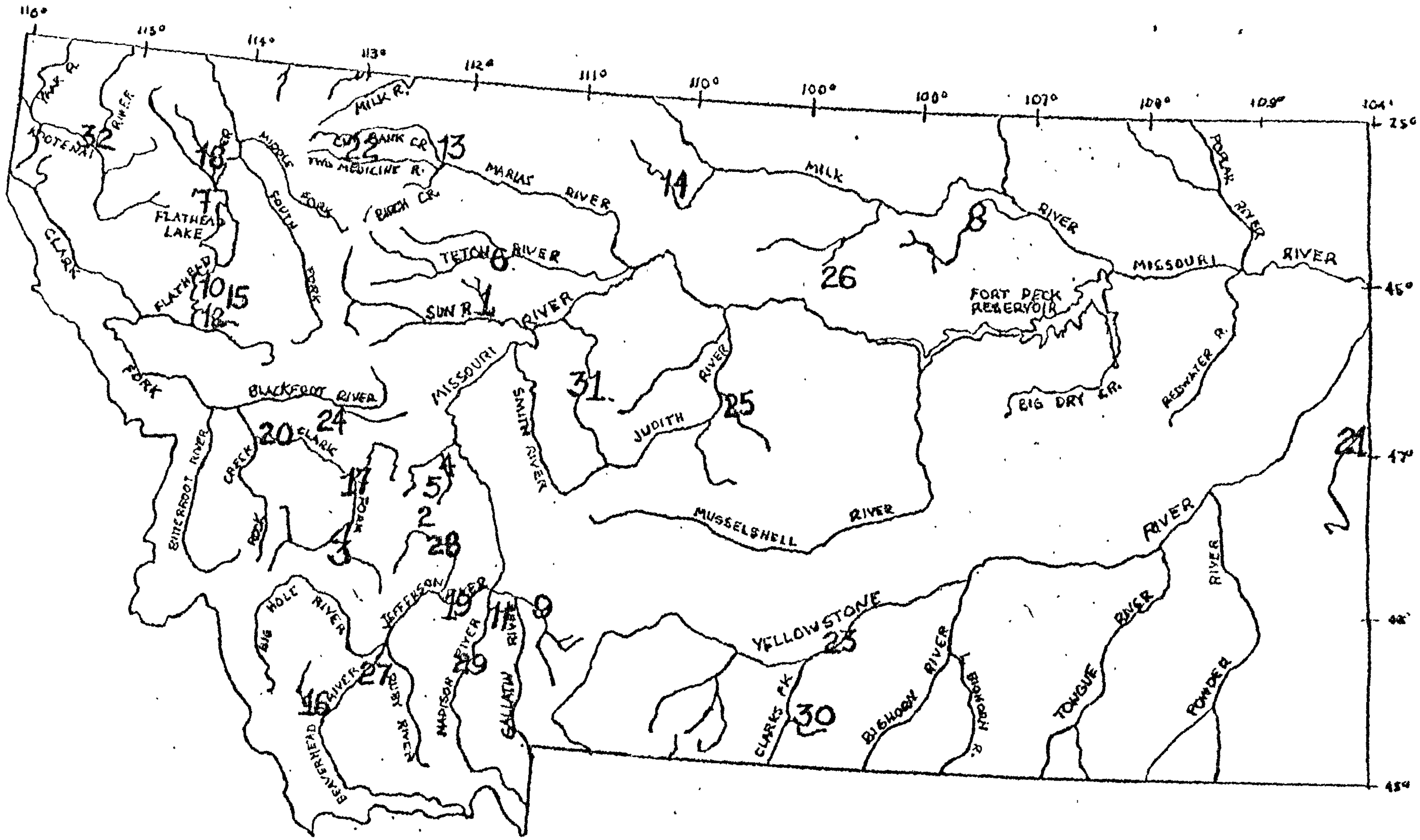


FIGURE 2: MONTANA WATER QUALITY PROBLEM AREAS

Success in correcting nonpoint source problems is limited by difficulties in implementing changes to long standing and accepted land use practices, and lack of funds for implementation. Important funding sources to implement better land management practices include the Department of Agriculture's Agricultural Conservation Program and Small Watershed Program, and the State of Montana's Renewable Resource Development and Water Development Program. EPA's Superfund Program and the Department of Interior Office of Surface Mining's Abandoned Mine Land Reclamation Program offer some hope for correcting water quality problems resulting from abandoned mining operations.

Dewatering of streams in Montana contributes to water quality degradation. Dewatering reduces a stream's dilution capacity and decreases biotic habitat. Dewatering is primarily caused by irrigation withdrawals. This is most noticeable on the Beaverhead, Bitterroot, West Gallatin, Big Hole and Jefferson Rivers, although it occurs on many other stream segments.

The Department of Health and Environmental Sciences has been awarded an instream flow reservation on the Yellowstone River for the purpose of protecting public water supplies. Water development projects on the Yellowstone are monitored to ensure compatibility with the instream reservation. Efforts to develop a similar instream flow reservation on the Clark Fork River have been halted since a downstream hydroelectric water right serves to protect instream flows.

Montana's severest groundwater problem results from saline seep. This phenomenon is caused by the dryland farming practice of summer fallowing. Excess soil moisture accumulates when vegetation is removed, and the moisture leaches salts from the soil and salinizes groundwater. Surface waters also become salinized by this phenomenon when the salinized groundwater feeds them.

There are areas in Montana that have very high environmental value. One of these areas is the Flathead River Basin in northwest Montana which includes Glacier National Park, Flathead Lake (the largest lake west of the Mississippi), several designated Wild and Scenic Rivers, the Flathead Valley, and the Bob Marshall Wilderness area (the largest in the west). Proposed major Canadian coal development, oil and gas development and other general development activities threaten to degrade these nationally significant resources. Accelerated nutrient contributions to Flathead Lake from changed land use and wastewater discharges are a specific concern.

A five year Congressionally authorized $2.6 million Flathead Basin Environmental Impact Study has recently been completed. This study has defined baseline conditions in the Basin and served to focus increased attention and resources on maintaining the air, water quality, fisheries, groundwater, wildlife and general high environmental values of the area. The Montana Legislature is expected to create a Flathead Basin commission to protect this resource.

COLORADO

Stream Segment with Impaired Use	Point Source Discharger	NPDES Compliance Status
1. South Platte River from Hampden to Henderson	Littleton/Englewood WWTP	NC
2. South Platte River from Henderson to Kersey	Boulder WWTP	C
3. Clear Creek from Idaho Springs to Youngfield	Idaho Springs WWTP	C
4. St. Vrain Creek from Longmont to mouth	Longmont WWTP	NC
5. Big Thompson River from Loveland to mouth	Loveland WWTP	C
6. Cache La Poudre River from Ft. Collins to mouth	Eastman Kodak	C
	Greeley WWTP	NC
7. Arkansas River from I-25 to La Junta	Pueblo WWTP	C
8. Fountain Creek from Monument to mouth	Colorado Springs WWTP	C

9. San Miguel River from Norwood Canyon to mouth	Union Carbide Corp.	C	126

Point Source Dischargers to Priority Stream Segments

MONTANA

Stream Segment with Impaired Use	Point Source Discharger	NPDES Compliance Status
1. Silver Bow Creek	Butte WWTP	C
2. ~~Prickly Pear Creek~~	~~Helena WWTP~~	C
below E. Helena	E. Helena WWTP	
3. Ashley Creek	Kallispell WWTP	
4. Crow Creek	Ronan WWTP	NC
5. Clark Fork River	Anaconda WWTP	
from Warm Springs	Butte WWTP	
to Garrison	Deer Lodge WWTP	NC
	Warm Spring WWTP	
6. Whitefish River	Whitefish WWTP	
below Whitefish Lake		
7. Jefferson River	Whitehall WWTP	
	Three Forks WWTP	
8. Clark Fork River	Anaconda WWTP	
from Garrison to	Butte WWTP	
Bonner	Deer Lodge WWTP	
	Warm Springs WWTP	

Point Source Dischargers to Priority Stream Segments

MONTANA

Stream Segment with Impaired Use	Point Source Discharger	NPDES Compliance Status
9. Beaver Creek below Wibaux.	Wibaux WWTP	
10. Willow Creek	Browning WWTP	NC
11. Yellowstone River from Laurel to Custer	Laurel WWTP	NC
	Billings WWTP	
12. Big Spring Creek	Lewistown WWTP	NC
13. Beaverhead River below Dillon	Dillon WWTP	NC
14. Boulder River below Basin	Boulder WWTP	
15. Madison River	Ennis WWTP	NC
16. Kootenai River below Libby Dam	Libby WWTP	NC

Point Source Dischargers to Priority Stream Segments [1.]

NORTH DAKOTA

Stream Segment with Impaired Use	Point Source Discharger	NPDES Compliance Status 2.
1. Souris River from confluence with Des Lacs River to confluence with Deep River	Velva WWTP Towner WWTP Minot WWTP	C
2. Red River from confluence with Wild Rice River to confluence with Sheyenne River	Moorhead WWTP	
3. Heart River from headwaters to confluence with Green River	Dickinson WWTP Belfield WWTP	C

1. These include only major permittees
2. "C" - In compliance with NPDES Permit
   "NC" - Non-Compliance with NPDES Permit

Point Source Dischargers to Priority Stream Segments

SOUTH DAKOTA

Stream Segment with Impaired Use	Point Source Discharger	NPDES Compliance Status
1. Lower Cheyenne River from confluence with Belle Fourche River to Oahe Dam	Homestake WWTP St. Regis Paper Co. Whitewood Post & Pole Strawberry Hill Mining Co.	
2. Upper Cheyenne River from Wyoming border to Angostora Reservoir	Edgemont WWTP Newcastle, Wyoming, WWTP	
3. Belle Fourche River from Whitewood Creek to confluence with the Cheyenne River	Homestake Mining Co.	NC
4. Middle Whitewood Creek from Lead to Belle Fourche River confluence	Whitewood WWTP St. Regis Paper Co. Whitewood Post & Pole Homestake	

Mining Co. Lead	
-Deadwood WWTP	C
Kirk Power Plant	NC (TSS)
Strawberry Hill	
Mining Co.	

Point Source Dischargers to Priority Stream Segments

SOUTH DAKOTA

Stream Segment with Impaired Use	Point Source Discharger	NPDES Compliance Status
5. Vermillion River Headwaters to confluence with the Missouri River	Centerville WWTP	
	Vermillion WWTP	C
	Chancellor WWTP	
	Howard WWTP	
	Salem WWTP	C
6. Lower James River from Milltown to Mayfield	Scotland WWTP	C
	Menno WWTP	
	Wolf Creek WWTP	
	Maxwell Colony WWTP	
	Parkston WWTP	
7. Upper James River from N.D. border to Huron	Redfield WWTP	C
	Stratford WWTP	
	Aberdeen WWTP	C
	Huron WWTP	C
	Ashton WWTP	
	Westport WWTP	
	Columbia WWTP	

Point Source Dischargers to Priority Stream Segments

SOUTH DAKOTA

Stream Segment with Impaired Use	Point Source Discharger	NPDES Compliance Status
8. Turtle Creek	Redfield WWTP	C
9. White River from NEB border to the Missouri River	Pine Ridge WWTP	
10. Little White River from headwaters to White River confluence	Martin WWTP	
	Rosebud WWTP	
	White River WWTP	C
11. Missouri River from Big Bend Dam to Pierre	Pierre WWTP	NC (BOD),
	Ft. Pierre WWTP	C (TSS)
12. Lower Big Sioux River from Sioux Falls to Missouri River	Sioux Falls WWTP	C
	John Morrell WWTP	NC
	Brandon WWTP	
	Alcestor WWTP	
	Eros Canton Livestock Sales	
	Sioux Falls Stockyards	

13. Upper Big Sioux River from Watertown to Sioux Falls	Dell Rapids WWTP	C
	Watertown WWTP	C
	Castlewood WWTP	
	Estelline WWTP	
14. Rapid Creek from Dark Canyon to Cheyenne River confluence	Rapid City WWTP	C

B-3: WETLANDS

Wetlands in general vary greatly and a recently developed classification system attempts to make distinctions between the various wetland types.[1] In EPA Region VIII there are numerous wetland types with various functions, recognized as beneficial to the public. Broad general descriptions of Region VIII wetlands include:

Prairie Potholes - This system of open marshes is in the Northcentral United States and Southcentral Canada. These "potholes" range in size from a few square yards to hundreds of acres, and have been called the "duck factory", as their most obvious function is providing breeding, nesting, feeding, and resting habitat for millions of waterfowl. Less obvious functions include floodwater retention, groundwater recharge, entrapment of sediment, stock watering, and habitat for numerous life forms, both aquatic and upland species.

Riparian Wetlands - Practically every stream in Region VIII has wetlands associated with it. Such wetlands provide a filter for surface runoff, preventing entry of many pollutants into streams and thereby helping to maintain instream water quality. They may also exhibit many or all of the functions generally ascribed to wetlands.

Montane Wetlands - Located in the high country, these wetlands are often the principal contributors to the headwaters of major streams. They provide habitat for many species of mountain dwelling wildlife.

Lacustrine Wetlands - These wetlands border the lakes of our region, providing a gradual transition between open water and upland. In addition to the numerous functions already mentioned, they protect lake shores against erosion resulting from waves created by wind or boat wakes.

The size of a wetland is not necessarily a factor in determining its value. Far more important are the condition and location of the wetland. Wetlands may easily be altered by persons to improve their overall functional values (enhancement) or changed to perform a desired function more efficiently, often at the expense of other functions. Wetlands are dynamic systems, and respond rapidly to external changes, both natural and human induced. What may appear to be a minor external change can have significant and far reaching effects on a wetland's functional value.

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[1] Cowardin, Lewis M. et al., Classification of Wetlands and Deepwater Habitats of the United States, FWS/OBS-79/31.

EPA has substantial responsibilities under the Section 404 program. These include:

1. Working with the Corps of Engineers (COE) in developing 404(b)(1) Guidelines.

2. Reviewing proposed projects for compliance with the Section 404(b)(1) Guidelines and submitting comments to the Corps.

3. Under Section 404(c), EPA has ultimate authority to veto permits based on certain environmental criteria (one case).

4. In conjunction with the state and Corps, EPA can designate geographic areas where permit decisions will normally be known in advance, therefore reducing delays.

5. EPA is to assist in development of state regulations for the assumption of the Section 404 permit program to afford the same level of environmental protection while reducing Federal involvement.

6. EPA has the authority to halt unauthorized discharges.

7. EPA can identify the boundary line of navigable waters.

Modification, degradation, and destruction of wetlands in Region VIII stems mainly from increasing and expanding agricultural development, industrial and residential development, recreational development, and dam construction. Prairie potholes are most seriously affected by agricultural development through filling and/or draining of these wetlands. Industrial and residential development has been responsbile for varying degrees of impact on wetlands in the more populous areas of Colorado and Utah. Wetlands bordering large lakes and riparian wetlands in mountain areas have mainly been affected by recreational development. Large dams for generation of electricity, flood control, and municipal and industrial water storage results in the filling and inundation of many acres of riparian wetlands.

In recent years the increased interest in wetlands as a valuable natural resource has led to an increased and intensified amount of research and scientific study of these land forms. The knowledge gained from these studies should provide the backbone for the proper and necessary policies and legislation to administer the programs which affect wetlands.

Future needs for wetland protection are:

1. Additional scientific knowledge about wetland functions and physiography,

2. Improved administrative measures to reduce any burden on the regulated public while assuring a high level of protection for wetlands,

3. Increasing the education of the public about wetland values, and

4. Providing the public with practical means of reducing impacts on wetlands.

Wetland protection must come from the joint efforts of an informed public, the diligence of governmental agencies, and the foresight and consciousness of legislators and policy makers.

GENERAL COMMENTS ON THE SECTION 404 PROGRAM

In a recent study, the loss of both inland and coastal wetlands has been shown to be a serious trend nationally with 400 thousand acres of coastal marshes, 6 million acres of forested wetlands, 400 thousand acres of shrub wetlands, and 4.7 million acres of inland marshes being lost between the mid 1950s and the mid 1970s. One of the areas of the most severe loses of inland wetlands in the nation was the prairie pothole region of North and South Dakota. Both of these states are within Region VIII's area.

The prairie potholes provide critical habitat for waterfowl breeding and are believed to contribute to the groundwater supplies. Wetland areas adjacent to waterways which are above the headwaters occur in all states. These wetland areas perform valuable functions including habitat for waterfowl and other animal species, breeding areas for fish species, water quality benefits, areas for the attenuation of flood water peaks, and in some cases, recharge areas for aquifers.

Since the data for this study was collected, the Corps of Engineers has promulgated new regulations (33 CFR Parts 320-330, July 22, 1982) which allow dredge and fill activities in closed basins and areas above the headwaters of the watercourse under a Nationwide permit. The conditions and best management practicies specified in the Nationwide permit have not proven to be effective in protecting these areas and the valuable functions that they perform.

Previous Section 404 regulations provided only limited protection to these areas, particularly the Prairie Pothole region, since they did not control wetland drainage. The current regulations do not afford even that limited protection since they do not provide for review to determine if there is compliance with the Nationwide Permit conditions. The continued application of the Nationwide Permits and the associated conditions on such wide scale areas as closed basins and all wetlands adjacent to waterways above the headwaters provides for neither the maintenance nor the restoration of the chemical, physical, and biological integrity of the Nation's waters. Until these areas are provided some degree of protection, the goals of the Clean Water Act will not be met.

B-4: COLORADO RIVER SALINITY

Salinity (total dissolved solids) is recognized as the major basinwide water quality problem in the Colorado River system. The salinity issues are of concern to the seven basin states (Wyoming, Utah, Colorado, New Mexico, Nevada, Arizona, and California), three EPA Regions (VI, VIII, IX), and the Departments of Interior and Agriculture. In addition, several Presidents of Mexico have expressed concern about the salinity of the water being delivered to Mexico. The United States has treaty obligations, limiting the salinity of the waters delivered to Mexico.

Salinity in the Colorado River is the result of both natural processes and the human activities. Salinity concentrations are affected through salt loading (such as irrigation return flows and land use disturbances) and through salt concentration (such as diversions of high quality water and reservoir evaporation). Virtually any water and/or land use activity can potentially impact salinity.

Salinity control is charged with controversy. Following seven enforcement conferences which began in the early 1960's and promulgation of salinity standards by EPA, the seven basin states acting through the Salinity Control Forum developed and adopted salinity standards in 1975. These standards included three numeric criteria and a plan for implementation. The numeric criteria are all on the lower main stem of the River (723 mg/l below Hoover Dam, 747 mg/l below Parker Dam, and 879 mg/l at Imperial Dam). The implementation plan calls for construction of Federal Salinity Control projects, placing effluent limitations on industrial and municipal discharges, inclusion of 208 Water Quality Management Plans and various state actions.

In the Colorado River Basin Salinity Control Act (PL 93-320), Congress authorized construction of a desalting complex to improve the quality of water delivered to Mexico as well as projects and programs for implementing salinity control throughout the basin. Despite the Congressional mandate, only limited implementation has actually occurred under PL 93-320. The escalating cost of the projects, as formulated by the Department of Interior, have been a serious impediment to construction of the control projects. Salinity control is further complicated by the fact that the Clean Water Act provides little regulatory authority for controlling the major causes of salinity. Progress is being made through the U.S. Department of Agriculture on-farm salinity control programs which are among the most cost-effective approaches for controlling salinity.

Current salinity damages in the Lower Basin are approximately $113 million per year and are estimated by the Department of Interior to rise to $267 million per year by the year 2010 if adequate salinity control projects are not implemented.

The principal EPA programs, under authority of the Clean Water Act, dealing with salinity control are: (1) Water Quality Management Planning, (2) Water Quality standards, and (3) the National Pollutant Discharge Elimination System (NPDES) Permits. Primary implementation of these programs is largely delegated to the States; however, EPA retains oversight and approval responsibilities. Because salinity is an inter-State and inter-National issue, EPA's oversight responsibilities are especially critical.

Additional EPA activities include providing program support and guidance for State and Forum salinity control activities. Examples of these activities include allocating 208 funds to help establish the Salinity Control Forum's Executive Director position, presenting testimony before Congress in support of the cooperative, basin-wide salinity control efforts, and working with individual states to assist in implementation of state salinity control activities.

Through EPA's responsibilities under the National Environmental Policy Act (NEPA), Environmental Impact Statements are reviewed for numerous impacts including salinity. EPA encourages alternatives which minimize and mitigate adverse salinity impacts through various approaches including water conservation and industrial use of saline water.

EPA has worked closely with the Bureau of Reclamation on the deep-well injection alternative for brine disposal in the Paradox Valley Salinity Control Project. EPA's involvement has occurred primarily as a result of EPA's responsibilities under NEPA and the Safe Drinking Water Act. Deep well injection appears feasible and may save from $50 to $60 million over the plan originally proposed by the Bureau of Reclamation.

Section 201 of the Colorado River Salinity Control Act (PL 93-320) requires the EPA, the Department of the Interior, and the Department of Agriculture, "...cooperate and coordinate their activities effectively to carry out the objective of this title." The Basin States and several federal agencies (Bureau of Reclamation and Soil Conservation Services) have suggested that to comply with their requirements EPA should be more involved in the planning and development of Federal Salinity control projects.

EPA Region VIII has been designated the lead to coordinate the activities of Regions VI, VII, IX, and Headquarters and to represent EPA in the activities of the Colorado River Basin Salinity Control Forum and the Interagency Salinity Control Coordinating Committee.

B-5: ACID DEPOSITION/WATER QUALITY CONCERNS

The potential water quality impacts of acid deposition in Region VIII are of concern because of the increasing evidence of acid precipitation and the limited natural buffering capacities of many lakes in the region. The critical importance of high altitude watersheds as sources of municipal water supplies and the significance of these watersheds and high altitude lakes as recreational resources (critical to tourism-based economics) makes a better understanding of ongoing and potential water quality impacts of acid deposition a significant environmental concern.

APPENDIX C. POLICY AND PROCEDURES

C-1: ADVANCED TREATMENT REVIEW

Under Congressional directives for the use of the annual construction grants program appropriations (FY 1979, 80, 81, 82, 83), grant funds may be used to construct new advanced treatment (AT) facilities with incremental AT costs of greater than $3 million, only if the Administrator personally determines that advanced treatment is required and will result in significant water quality and public health improvement.

EPA interpreted this directive in the form of a Program Requirement Memorandum issued on March 9, 1979 (PRM-79-7). On June 20, 1980, the Agency published proposed revisions to the PRM in the Federal Register; however, the revisions were not officially implemented.

EPA is revising its policy relative to advanced treatment funding. The final draft of a new policy statement was released for Regional review on December 17, 1982. Publication of the final policy in the Federal Register is expected soon. Some significant issues addressed in the December 17, 1982 draft AT policy, which will affect Region VIII relate to the following criteria:

1. Scientific data, information, and analyses must document an existing impairment of a designated use or a use impairment that would result without the project.

2. A reasonable relationship has been scientifically established between the impairment of a designated use and pollutant loadings.

3. The additional reduction of pollutant loadings resulting from construction and proper operation of the AT facility will make a substantial contribution toward the restoration of the designated use or will prevent impairment of a designated use by the proposed project.

4. All other point source discharges that contribute pollutants resulting in the use impairment of the affected waterbody are regulated under the National Pollutant Discharge Elimination System (NPDES).

5. Provisions have been made to implement those nonpoint source pollution controls considered necessary for restoring a designated use, and such provisions are included in a certified and approved water quality management plan.

For the purpose of AT reviews, the December 17, 1982 draft policy defines secondary treatment as a treatment level meeting effluent limitations for five day biochemical oxygen demand (BOD_5) and suspended solids (SS) of 30/30 mg/l on a maximum monthly average basis or as 85 percent removal of these parameters, whichever is more stringent (40 CFR Part 133). A proposed project designed to meet other definitions of secondary treatment (e.g. 25/25 mg/l BOD/SS) are not subject to reviews, if the more stringent level of effluent quality is required by state regulation, and secondary treatment technologies are proposed to achieve these levels. Projects that provide treatment more stringent than secondary treatment or provide treatment for removal of ammonia or phosphorus are referred to as advanced treatment (AT) projects. For the purposes of this policy, an AT project shall be defined as any project that: (a) is required in order to meet effluent limitations for BOD or SS less than 30 mg/l (30-day average), or (b) is required in order to meet effluent limitations for the removal of ammonia or phosphorus.

All AT projects with an incremental capital cost for AT in excess of $3 million and not otherwise exempted, must be approved by the EPA Administrator in order to receive a Step 3 grant.

All AT projects with an incremental capital cost for AT of $3 million or less must be approved by the Regional Administrator (RA) in order to receive a Step 3 grant. The RA may delegate the AT project review responsibility to States with 205(g) delegation for the review of facilities plans.

The final draft AT review policy emphasizes the need for a rigorous justification of the water quality and public health improvements derived from AT projects. This change reflects both the likelihood that the availability of construction grant funds will be limited and the need to use limited funds on the attainment of significant water quality or public health improvements. The significance of improvements resulting from an AT project will be assessed in terms of contributions to restoring designated uses or preventing their impairment. The AT project review criteria will require a demonstration that there is an existing impairment of a designated use or that a use impairment would result without the proposed AT processes, the establishment of a reasonable scientific relationship between the impairment and pollutant loadings, and a demonstration that each AT process will make a substantial contribution to the restoration of a designated use or prevent the impairment of a designated use by the project. The policy statement thus reflects program initiatives that require demonstration of a substantial contribution towards the restoration of designated uses. Showing only improvements in chemical water quality parameters may not suffice because other factors such as man-made physical or hydrologic modifications of a stream or intermittent flows may restrict or prevent use attainment. For each project, funding decisions will be based upon the best available scientific information and the best professional judgment of the responsible official, regarding the extent to which the project meets the review criteria. Specific factors for conducting AT reviews, for example, averaging periods, critical flows, and mixing zones used in wasteload allocation studies, are described in guidance documents which are being developed.

The draft AT policy is unclear in its effect on state water quality standards, the basic regulatory mechanism for determining the beneficial uses to be protected and the water quality levels necessary to protect them for each body of water. The standards include designated uses and criteria established to protect each use. AT project reviews are not anticipated to substitute for EPA's required review of water quality standards, because the AT reviews are predicated on a different objective, are project-specific, and result in an EPA funding decision. Although the reviews may raise questions about the impact of a State standard on discharges in a segment, a separate State-initiated action is necessary to review and revise the standards.

EPA's proposed water quality standards regulation, among other things, will allow States to perform analyses to determine whether designated uses are attainable and if the standards reflect site-specific conditions. In determining whether a proposed AT project meets the criterion of making a substantial contribution toward restoration of a designated use or prevention of a use impairment that would occur without the project, the AT project review will take into account use attainability analyses. The Clean Water Act, as amended, requires that the applicable water quality standards for all construction grant related water bodies be thoroughly reviewed by December 29, 1984. Federal funding will not otherwise be allowed for the facilities.

The most controvertial water quality parameter being scrutinized in the AT reviews is ammonia. Due to the significant uncertainties concerning the acute and chronic effects of ammonia on freshwater aquatic life, AT facilities proposed solely for the purpose of preventing ammonia toxicity will be approved only if the following has been demonstrated:

1. Site specific biological data show that designated uses cannot be restored (or impairment prevented) without reducing ammonia toxicity; or,

2. bioassay data (e.g., either laboratory or from a similar site) for resident species show that existing or future ammonia toxicity levels will impair beneficial use attainment.

(Appendix C, Table 1) identifies those projects in Region VIII which may require AT reviews this year. A majority of them are associated with ammonia control. The states and Region VIII will have to devote a considerable amount of time and resources to these project reviews in order to justify their funding. Unfortunately, much of the required data (chemical, flow, biological, etc.) is not presently available to facilitate an expeditious, yet credible AT review. It is strongly recommended that Region VIII support the research needs outlined below to assist the states in AT reviews for ammonia control.

Table C-1. Potential Advance Treatment Projects in Region VIII

	Receiving Water	Problem Parameter	Population Served (Design)
Montana			
Missoula	Oak Fork	NH_3	46,800
Kalispell	Ashley Creek to Flathead Lake	nutrients	32,600
South Dakota			
Centerville	Vermillion River	NH_3	940
Custer	French Creek	NH_3	20,000
Huron	James River	NH_3	15,000
Milbank	Whetstone River	NH_3	5,050
Rapid City	Rapid Creek	NH_3	72,600
Vermillion	Vermillion River	NH_3	15,700
Watertown	Big Sioux River	NH_3	23,300
Wyoming			
Casper	N. Platte	NH_3	125,000
Baggs	Little Snake River	NH_3, DO	412
Utah			
Central Valley	Jordan River	NH_3, DO	394,000
Orem	Powell's Slough	NH_3	77,654
Bear Lake	Bear Lake	Nutrients	11,389
Coalville	Weber River	Nutrients NH_3	1,294

C-2: ANTIDEGRADATION

All six states in Region VIII have antidegradation policies very similar to that described in 40 CFR 35.1550. Two states (Montana and South Dakota) prescribe antidegradation rules by statute. The remaining state's antidegradation policies are contained in regulations. Colorado, Montana, Utah and Wyoming have special policies related to nondegradation, a policy very similar to that of EPA's related Outstanding National Resources Water. Such water bodies are specifically classified by the states as unique and identified as such within their water quality standards. No change is allowed in existing quality.

Implementing control regulations on high quality waters, i.e. those with quality better than the 1983 goals, has been difficult in Region VIII. Many of the water bodies in Region VIII are of high quality and the Region is in the process of developing a procedure to: 1) define existing quality through a computerized, flow-weighted analysis, and 2) define significant change in existing quality. Because most of our (State, USGS and EPA) monitoring efforts have been concentrated in areas where we have water quality problems, the lack of water quality data and flow monitoring are frustrating our efforts in high quality areas.

Table 2. show the existing high quality waters in Region VIII. Because of their unique characteristics and the impending natural resources development anticipated within the respective watersheds, the states in Region VIII consider these water as priority water bodies. Region VIII supports the state's position.

C-3: SITE-SPECIFIC CRITERIA/USE ATTAINABILITY STUDIES

States will no longer be required to review all of their standards statewide every three years. Rather, States are encouraged to focus their resources on analyzing their standards for priority water bodies where one or more stringent controls are needed to attain designated uses.

Priority water bodies are identified in accordance with the revised regulation for water quality management planning (40 CFR Part 130), guidance for state preparation of Section 305(b) reports, and the State's Continuing Planning Process (CPP). In addition to the water quality standards review, priority water quality areas will be selected for establishing total maximum daily loads and waste load allocations, special reviews for major permits, developing construction grant priority lists and focusing monitoring, enforcement and reporting efforts. Priority areas may include those areas where advanced treatment (AT) and combined sewer overflow (CSO) funding decisions are pending, new or reissuances of major water quality permits are scheduled, or toxics have been identified or are suspected of precluding a use or may be posing an unreasonable risk to human health.

TABLE C-2 - Colorado "Antidegradation" Segments

A. South Platte Basin
1. Bear Creek above Perry Park Reservoir
2. All waters in Rocky Mountain National Park (some exceptions)
3. All waters in Indian Peaks Wilderness
4. All waters in Mount Zirkel Wilderness
5. All waters in Rawah Wilderness

B. Arkansas Basin
1. Ricardo Creek
2. South Huerfano Creek above Cascade Creek

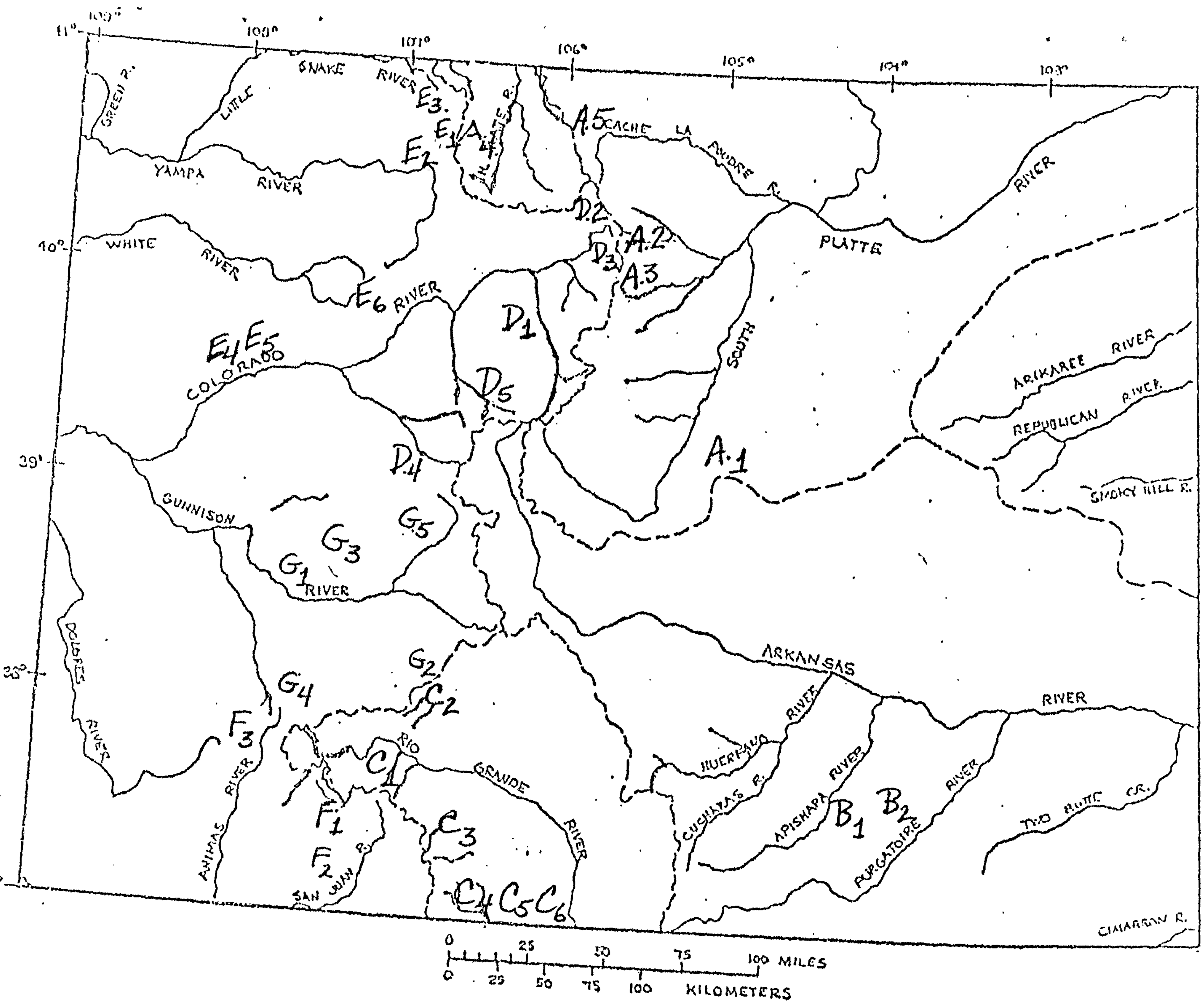
C. Rio Grande Basin
1. All waters in Weminuche Wilderness
2. All waters in La Garita Wilderness
3. Conejos River, source to outlet Platoro Reservoir including mainstem of the South Fork
4. Los Pinos
5. Cascade Creek
6. Osler Creek

D. Colorado River Basin
1. All waters in Gore-Eagles Nest Wilderness
2. All waters in Rocky Mountain National Park
3. All waters in Indian Peaks Wilderness
4. All waters in Snowmass-Maroon Bells Wilderness
5. All waters in Hunter-Fryingpan Wilderness

E. Yampa and White River Basins
1. All waters in Mount Zirkel Wilderness
2. Elk River above Glen Eden
3. Little Snake River on National Forest land in Routt County
4. Trapper Creek
5. Northwater Creek
6. Trapper Lake and Tributaries thereto

F. San Juan and Dolores Basin
1. All waters in Weminuche Wilderness
2. Piedra River above Indian Creek
3. All waters in the Lizard Head Wilderness

G. Gunnison Basin
1. Gunnison River from Crystal Reservoir to one mile below Smith Fork
2. All waters in La Garita Wilderness
3. All waters in Big Blue Wilderness
4. All waters in Mount Sneffels Wilderness
5. All waters in West Elk, Collegiate Peaks, Maroon Bells, Ragged and Oh-Be-Joyful Wildernesses


109°
108°
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39°
38°
37°
GREEN R.
LITTLE
SNAKE RIVER
YAMPA RIVER
WHITE RIVER
COLORADO RIVER
GUNNISON RIVER
DOLORES RIVER
ANIMAS RIVER
SAN JUAN R.
RIO GRANDE RIVER
CACHE LA POUDRE R.
SOUTH PLATTE RIVER
ARIKAREE RIVER
REPUBLICAN RIVER
SMOKY HILL R.
ARKANSAS RIVER
HUERFANO RIVER
CUCHARAS R.
APISHAPA RIVER
PURGATOIRE RIVER
TWO BUTTE CR.
CIMARRON R.
A.1
A.2
A.3
A.4
A.5
B1
B2
C1
C2
C3
C4 C5 C6
D1
D2
D3
D4
D5
E1
E2
E3.
E4 E5
E6
F1
F2
F3
G1
G2
G3
G4
G5
0 25 50 75 100 MILES
0 25 50 75 100 KILOMETERS

COLORADO

TABLE 3. Montana "Nondegradation" Stream Segments*

1. Headwater tributaries of Marias, Teton, and Sun Rivers in Bob Marshall/Great Bear Wilderness Areas

2.	Post Creek	- all water in Montana National Bison Range
3.	Middle Fork Flathead River	- left bank tributaries in Glacier National Park
4.	South Fork Flathead River	- in Bob Marshall Wilderness area
5.	Flathead River	- right bank tributaries in Glacier National Park
6.	Bitteroot River	- right bank tributaries in Selwood Bitteroot - Wilderness area as follows: Carleton Creek, One Horse Creek, Sweeney - Creek, Bass Creek, Kootenai Creek, Big Creek, Sweathouse Creek, Bear - Creek, Fred Burr/Sheafman/Mill Creeks,

Blodgell Creek, Canyon Creek
- Sawtooth Creek, and Roaring Lion Creek; also all waters in Ravalli
- National Wildlife Refuge

7. Saint Mary River - in Glacier National Park

8. Belly River - in Glacier National Park

9. Lamesteer Creek - in Lamesteer National Wildlife Refuge

10. Yellowstone River - in Yellowstone National Park

11. Midvale Creek - in Glacier Nationa Park

12. Two Medicine River - in Glacier National Park

13. Cut Bank Creek - in Glacier National Park

14. Gallatin River - Yellowstone National Park to headwaters

15. Madison River (Head of Missouri River) - in Yellowstone National Park

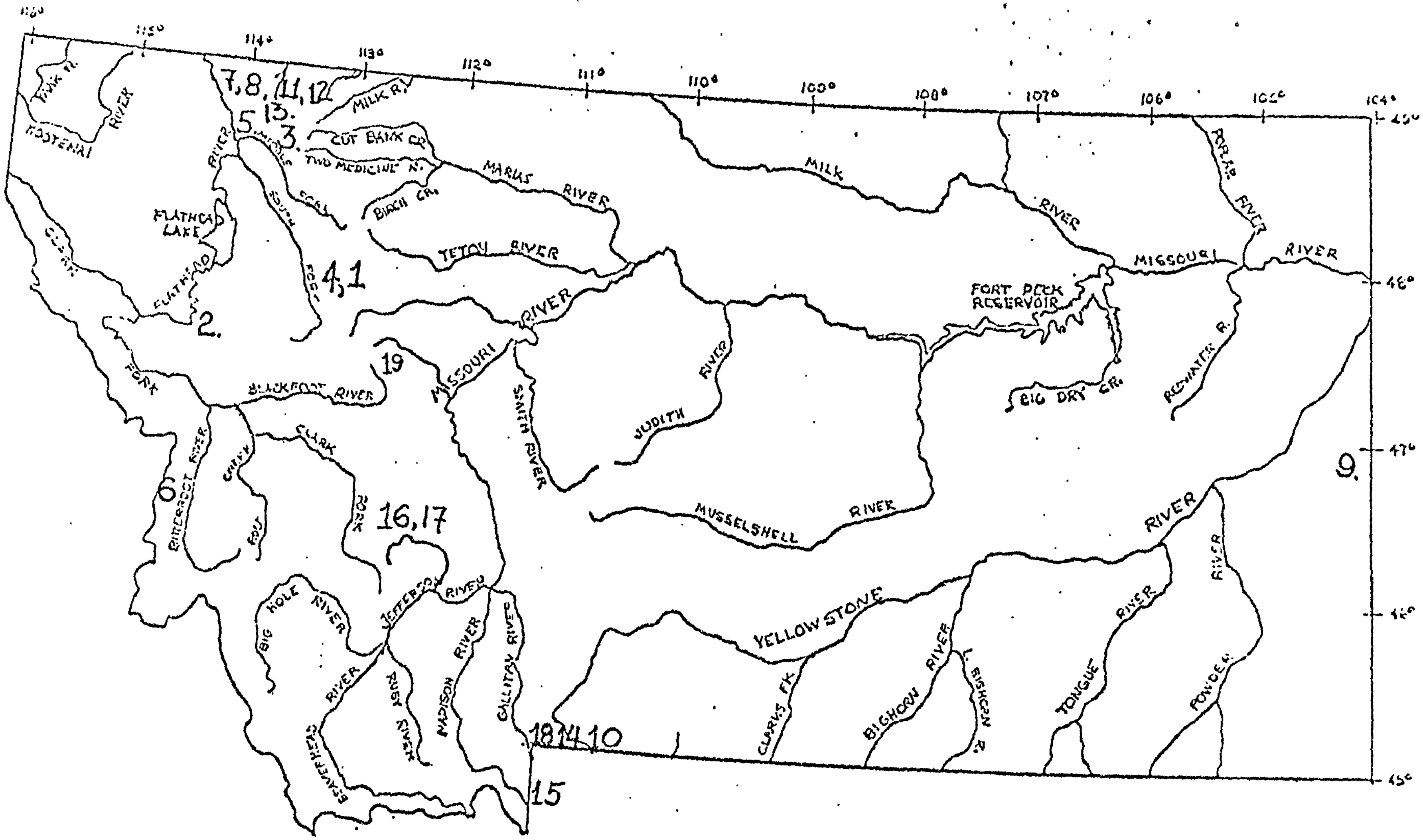
16. Headwaters Boulder River - in Beartooth Absaroka Wilderness Area

17. Headwaters Stillwater River - in Beartooth Absaroka Wilderness Area

18. Gardiner River - in Yellowstone National Park Wilderness Area

19. Dearborn River - in Lincoln Scapegoat Wilderness Area

*Nondegradation applies to all waters in the state except that Board of Health can allow degradation if it determines it is required by necessary economic and social development. Board cannot allow degradation of waters in National Parks and Wilderness areas.



MONTANA

0 10 20 30 40 50 MILES
0 20 40 60 80 KILOMETERS

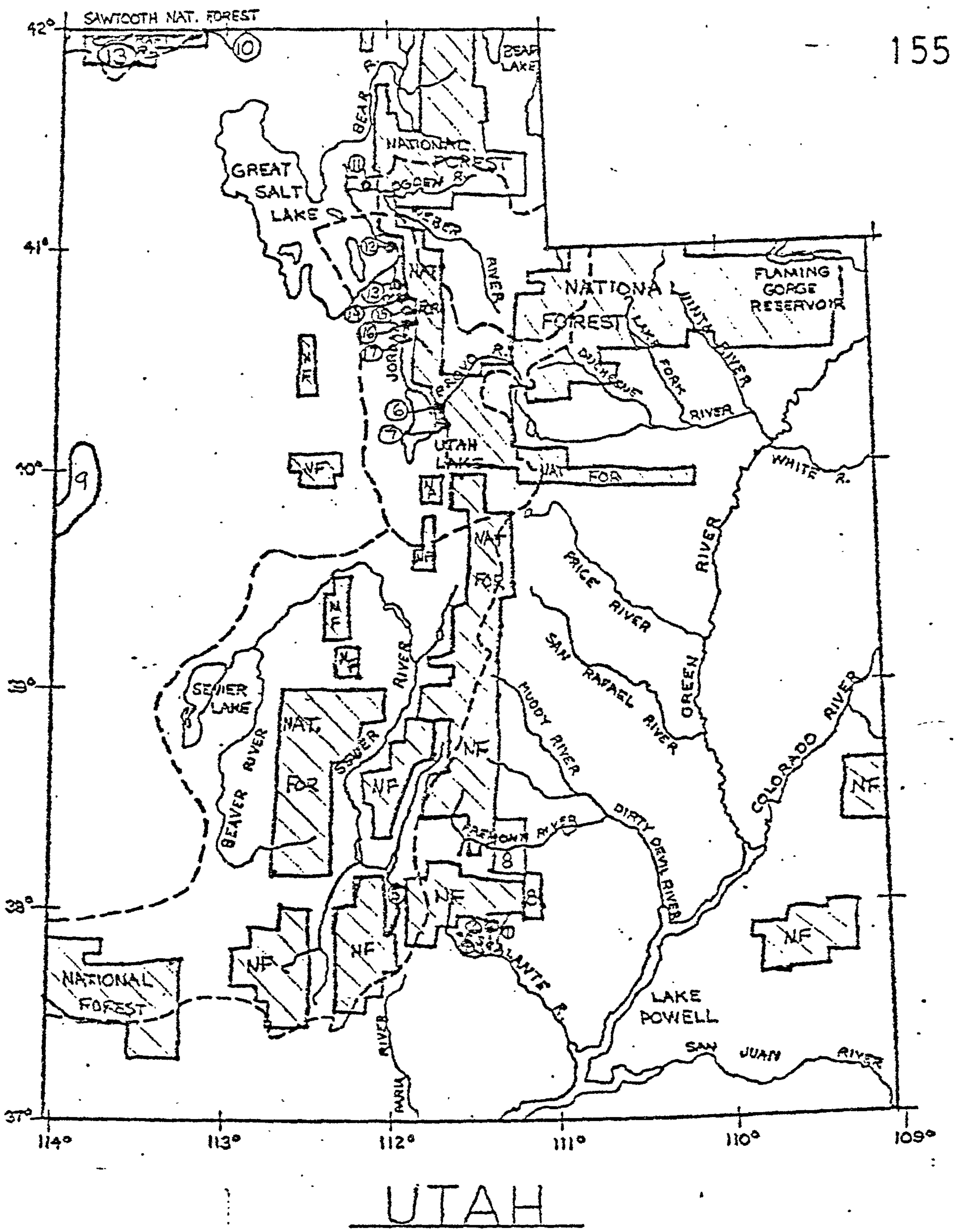
TABLE 3. Utah "Antidegradation" Streams

1.	Deer Creek	- entire mainstem and tributaries
2.	Calf Creek	- entire mainstem and tributaries
3.	Sand Creek	- entire mainstem and tributaries
4.	Mamie Creek	- entire mainstem and tributaries
5.	Box Elder Creek	- entrance of Cache National Forest to headwaters (mainstem)
6.	Deep Creek	- all water on public lands in the Deep Creek Mountains
7.	Middle Fork Kays Creek	- mainstem and drainage
8.	South Fork Kays Creek	- mainstem and drainage
9.	Kays Creek	- mainstem and drainage within Wasatch National Forest
10.	Holmes Creek	- from U.S. Highway 89 to headwaters
11.	Shepard Creek	- entire length, mainstem and drainage
12.	Farmington Creek	- from Haight Bench Canal Diversion to headwaters, mainstem and drainage
13.	Steed Creek	- entrance of Wasatch National Forest to headwaters, mainstem and drainage
14.	Stone Creek	- entrance of Wasatch National Forest to headwaters, mainstem and drainage
15.	Barton Creek	- entire mainstem and drainage
16.	Mill Creek	- entrance into Wasatch National Forest to headwaters, mainstem and drainage
17.	North Canyon Creek	- entire mainstem and drainage
18.	City Creek	- WWTP to headwaters, mainstem
19.	Red Butte Creek	- Foothill Blvd., SLC, to headwaters, mainstem and drainage
20.	Emigration Creek	- from Hogle Zoological Gardens to headwaters, mainstem and drainage
21.	Parley's Creek	- from 1300 East St. (0.2 miles from mouth) to headwaters, mainstem and drainage
22.	Big Cottonwood Creek	- from Wasatch Blvd., to headwaters, mainstem and drainage

23. Little Cottonwood Creek - from WTP (Metro Lower Division) to headwaters, mainstem and drainage
24. Bells Canyon Creek - entire mainstem and drainage
25. South Fork Dry Creek - mainstem and drainage
26. Little Willow Creek - from entrance into Wasatch National Forest to headwaters, mainstem and drainage
27. Dry Creek - from entrance into Uinta National Forest to headwaters, mainstem and drainage
28. Rock Canyon Creek - from entrance into Uinta National Forest to headwaters, mainstem and drainage
29. Bridal Veil Falls - above Provo Diversion, mainstem and drainage
30. Lost Creek - above Provo Diversion, mainstem and drainage
31. Upper Falls - above Provo Diversion, mainstem and drainage
32. Summit Creek - mainstem and drainage in Uinta National Forest
33. Twelvemile Creek - mainstem and drainage in Manti-La Sal National Forest
34. Manti Creek - mainstem and drainage in Manti-La Sal Nationa; Forest
35. Ephraim Creek - mainstem and drainage in Manti-La Sal National Forest
36. Oak Creek - mainstem and drainage in Manti-La Sal National Forest
37. Fountain Green Creek - mainstem and drainage in Uinta National Forest
38. East Fork Sevier - from Tropic Diversion to headwaters, mainstem and drainage
39. George Creek - mainstem and drainage in Sawtooth National Forest (12.5 miles from mouth)
40. Clear Creek - Idaho-Utah State Line to headwaters, mainstem and drainage
41. Strongs Canyon Creek - from entrance into Cache National Forest to headwaters, mainstem and drainage

42. <u>Burch Creek</u> - from Harrison Blvd., (3.4 miles from mouth) to headwaters, mainstem and drainage

43. <u>Spring Creek</u> - from entrance into Cache National Forest to head waters, mainstem and drainage


SAWTOOTH NAT. FOREST
GREAT SALT LAKE
BEAR LAKE
NATIONAL FOREST
OGDEN R.
WEBER RIVER
UTAH LAKE
PROVO R.
FLAMING GORGE RESERVOIR
UINTA RIVER
LAKE FORK RIVER
WHITE R.
GREEN RIVER
PRICE RIVER
SAN RAFAEL RIVER
MUDDY RIVER
FREMONT RIVER
DIRTY DEVIL RIVER
COLORADO RIVER
LAKE POWELL
SAN JUAN RIVER
SEVIER LAKE
SEVIER RIVER
BEAVER RIVER
PARIA RIVER
NAT. FOR
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37°
114°
113°
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111°
110°
109°
0 20 40 60 MILES
0 20 40 60 80 KILOMETERS

UTAH

Wyoming "Antidegradation" Streams

(1) All surface waters located within the boundaries of National Parks;.

(2) All surface waters located within the boundaries of Congressionally designated Wilderness Areas.

(3) The main stem of the Snake River through its entire length above the U.S. Highway 22 bridge (Wilson Bridge).

(4) The main stem of the Green River including the Green River Lakes from the mount of the New Fork River upstream to the wilderness boundary.

(5) The main stem of the Wind River from the boundary of the Wind River Indian Reservation upstream to Boysen Dam.

(6) The main stem of the North Platte River from the mouth of the Sage Creek (approximately 15 stream miles below Saratoga, Wyoming) upstream to the Colorado state line.

(7) The main stem of the North Platte River from the headwaters of Pathfinder Reservoir upstream to Kortes Dam.

(8) The main stem of Sand Creek from the U.S. Highway 14 bridge upstream to the lowermost boundary of the U.S. Fish and Wildlife Service Fish Genetics Laboratory.

(9) The main stem of the Middle Fork of the Power River through its entire length above the mouth of Buffalo Creek.

(10) The main stem of the Tongue River, the main tem of the North fork of the Tongue River and the main stem of the South Fork of the Tongue River above the U.S Forest Service boundary.

(11) The main stem of the Sweetwater River above the Alkali Creek.

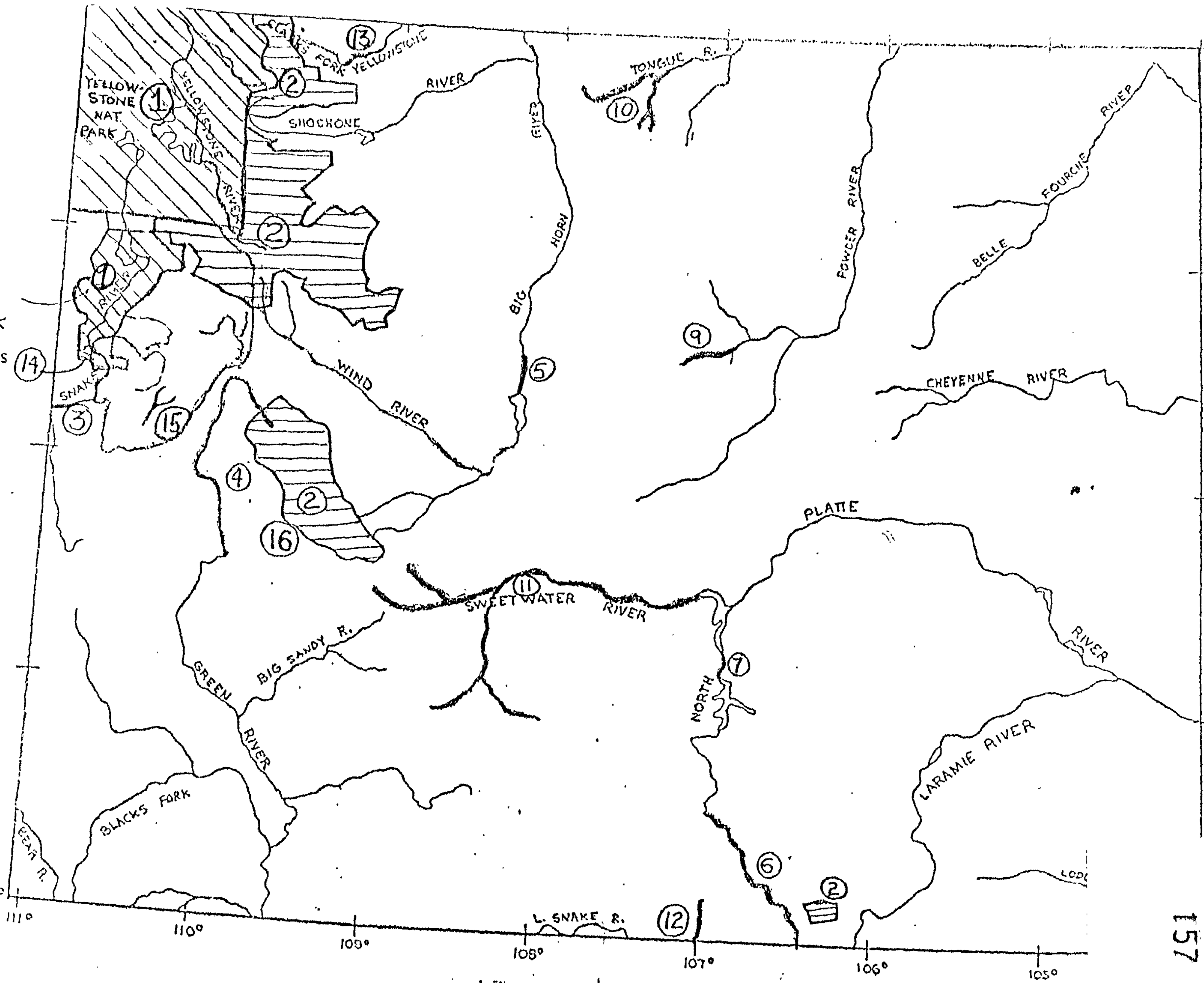
(12) The main stem of the Encampment River from the U.S. Forest Service boundary upstream to the Colorado state line.

(13) The main stem of the Clarks Fork River from the U.S. Forest Service boundary upstream to the Montana state line.

(14) All waters within the Fish Creek (near Wilson, Wyoming) drainage.

(15) The main stem of Granite Creek (tributary of the Hoback River) through its entire length.

(16) Fremont Lake.


YELLOW-
STONE
NAT.
PARK
YELLOWSTONE RIVER
CLARKS FORK YELLOWSTONE
SHOSHONE
RIVER
TONGUE R.
BIG HORN RIVER
POWDER RIVER
BELLE FOURCHE RIVER
CHEYENNE RIVER
WIND RIVER
GRAND
TETON
PARK
&
WILDERNESS
AREA
SNAKE
SNAKE RIVER
PLATTE
NORTH
RIVER
SWEETWATER RIVER
BIG SANDY R.
GREEN RIVER
BLACKS FORK
BEAR R.
LARAMIE RIVER
L. SNAKE R.
45°
44°
43°
42°
41°
111°
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108°
107°
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WYOMING

In selecting priority areas, states should also take into account the "Municipal Wastewater Treatment Construction Grant Amendments of 1981" (P.L. 97-117, December 29, 1981). EPA interprets Section 24 of the Amendments as requiring States to assure that water quality standards influencing construction grant decisions have been reviewed in accordance with Section 303(c) of the Clean Water Act. It prohibits the issuance of a grant after December 1984, unless the State has completed its review of the water quality standard for any segments affected by the project grant (see Interim Final Rule 40 CFR 35.2111, 47 CFR 20450, May 12, 1982).

To comply with Section 24 on effluent limited segments no further water quality standards review will be needed beyond the determination that the segment is effluent limited. A more comprehensive review will be required for water quality limited segments for which AT project application are anticipated. The level of reivew is dependent on particular site-specific conditions. This guidance describes analyses which states may find appropriate in reviewing their water quality standard in detail.

A water body survey and assessment examines the physical, chemical, and biological characteristics of the water body to identify and define the existing uses of that water body. It is also used to determine whether the designated uses in State water quality standards are impaired and to identify the reasons why the uses are impaired. In addition, the water body survey and assessment assists States in projecting what use the water body could support in the absence of pollution and at various levels of pollution control for point and nonpoint sources.

The data and information from the chemical sampling and analyses and biological surveys collected as part of the water body survey and assessment are used to develop site-specific criteria. In developing site-specific criteria, the characteristics of the local water body are taken into account. EPA's laboratory-derived criteria may not accurately reflect the toxicity of a pollutant in a water body because of differences in temperature, p^H, etc. Similarly, adaptive processes may enable a viable, balanced community to exist with levels of certain pollutants that exceed their national criteria. Region VIII intends on conducting such an analysis on the Jordan River.

Total maximum daily loads and wasteload allocations are developed as part of the evaluation of the attainability of various uses and control options. Guidance on waste load allocations is not included here but is available in draft from EPA.

In analyzing the attainability of uses, water body survey and assessments, site-specific criteria, waste load allocations and benefit-cost assessments provide the basis for setting site-specific water quality standards. NOT EVERY WATER QUALITY STANDARDS DECISION WILL REQUIRE THAT ALL OF THE ANALYSES BE CONDUCTED. States may change or modify their water quality standards if:

- o criterion for particular pollutants are more stringent than necessary or are not stringent enough to protect a use;
- o naturally occurring pollutant concentrations prevent the attainment of the use;
- o natural, ephemeral, intermittent or low flow conditions or water levels prevent the propagation or survival of fish and other aquatic life. However, these natural conditions may be compensated for by the discharge of sufficient volume of effluent to enable uses to be met;
- o human diversions or other types of hydrologic modifications interfere with the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that will maintain the use;
- o physical conditions unrelated to water quality preclude attainment of the use; or

In determining the level of detail necessary for a review of the water quality standards, it is useful to analyze and display those attributes of a review which increase the complexity of the analyses. There may be issues involving the scientific and technical or economic and social or institutional and legal aspects of the review which increase the complexity of the review. By way of example, the matrix in Figure i lists a number of attributes of a water quality standards review which could increase its complexity. Hatch marks or a description in the appropriate cells of the matrix may assist in determining the overall approach or in highlighting a particular area of the review that may require more detailed analysis.

APPENDIX D. POSSIBLE REMEDIES FOR AND FEASIBILITY OF WATER QUALITY IMPROVEMENT

D-1: JORDAN RIVER USE ATTAINABILITY ANALYSIS

A major regionalization of sewage treatment facilities is underway in the Jordan River Valley. Within Salt Lake County, 7 separate sewage treatment facilities will be consolidated into two regional plants. These regional plants (Central Valley and South Valley) will need to go beyond polished secondary-based effluent limitations in order to meet Utah water quality standards for the Jordan River. The South Valley Plant will discharge to a segment of the Jordan River (Narrows Diversion-Little Cottonwood Creek) which is classified for coldwater aquatic life, secondary contact recreation, and agricultural use. The Central Valley Plant will discharge to a segment of the Jordan River (Little Cottonwood Creek to North Temple Street) which is classified for warmwater aquatic life, secondary contact recreation, and agricultural use.

The pollutants of principal concern in both cases are total residual chlorine, ammonia and the control of oxygen demanding substances (BOD, COD) in order to meet dissolved oxygen criteria. Both treatment facilities have identical NPDES permit limitations. Much of the work to establish these limitations was completed during the early and mid-70s. Since that time, substantial new information has been developed nationally on the effects of ammonia, chlorine and dissolved oxygen upon warmwater species of aquatic life and locally in Salt Lake County on the contribution of urban runoff to water quality problems in the Jordan River. Additionally, the activities of the Provo-Jordan River State Parkway has created an increased public interest in the Jordan River.

The relative scarcity of sewage treatment plant construction funds requires that the water quality benefits of each waste treatment dollar be maximized. The study effort should be designed to determine the potential use(s) for which the Jordan River could be managed given the anticipated improvement in water quality associated with the new treatment facilities. To identify those potential uses, it will be necessary to define the point at which, flow and habitat vs. water quality limit the uses. In order to fulfill this requirement, it is necessary that existing data pertaining to the Jordan be evaluated, data gaps identified, any necessary additional data be collected and appropriate water quality management decisions made. The first phase in use attainability analysis is the review of existing data, the identification of data gaps, and the development of recommendations for the collection of any necessary additional data, with the estimated cost of collecting such data. Subsequently, Region VIII intends to provide technical support in the development of site-specific water quality criteria recommendations for the Jordan River.

Region VIII is in the process of identifying similiar study needs in South Dakota, Wyoming and Colorado. With present resource limitations however, it is highly unlikely that Region VIII will be able to actively participate in more than the Jordan River study.

D-2: NATIONWIDE URBAN RUNOFF PROJECT

The possible deleterious water quality effects of nonpoint sources in general, and urban runoff in particular, were recognized by the Water Pollution Control Act Amendments of 1972. Because of uncertainties about the true significance of urban runoff as a contributor to receiving water quality problems, Congress made treatment of separate stormwater discharges ineligible for Federal funding when it enacted the Clean Water Act in 1977. To obtain information that would help resolve these uncertainties, the Agency established the Nationwide Urban Runoff Program in 1978. This five-year program is intended to answer questions such as:

- o To what extent is urban runoff a contributor to water quality problems across the nation?
- o What is the effectiveness of controls short of treatment in reducing water quality problems where they exist?
- o Are best management practices for control of urban runoff cost effective in comparison to alternative options?

Region VIII has three ongoing NURP projects: Rapid City, Salt Lake City and Denver. Significant results are already beginning to emerge from these efforts.

Preliminary Findings/indicate the following:

POLLUTANT LOADING

The end product of the NURP program will provide quantitative expressions of urban runoff quality as related to regional factors, seasonal factors, and land use factors. Total suspended solids concentrations in urban runoff appear to be lower than suggested by pre-NURP studies. About one-half of the substances on EPA's priority pollutant list occur in urban runoff. Heavy metals, (especially lead, zinc, and copper) are much more prevalent than organic priority pollutants. Some of the metals are present often enough and in high enough concentrations to be considered threats to "beneficial uses".

WATER QUALITY EFFECTS

Heavy metals appear to be the urban runoff contaminants that have the greatest potential for impacts on the aquatic life "beneficial use". Little is known, however, about the actual impacts because little research has been done on influences of short term exposure of pollutants to aquatic life. The available documentation indicates that suspended solids have an even greater negative influence on aquatic life habitat than to metals. Priority organic pollutants do not appear to pose a general threat to freshwater aquatic life, but do pose a danger in the cases where drinking water intakes are directly downstream from urban runoff channels.

CONTROL EFFECTIVENESS

Recharge basins appear to be effective and economical in the treatment of urban runoff, whereas street sweeping is an overall ineffective means of treatment. Depending on the design, detention basins can be very effective in removing suspended solids, heavy metals (especially copper), phosphorus, and COD to some degree.

D-3: THE DILLON WATER BUBBLE

An innovative project exploring the opportunity for achieving water quality standards while saving costs at wastewater treatment facilities has begun in Summit County, Colorado. The project is a unique proposal from the Northwest Colorado Council of Governments (NWCOG) which would involve a pollution trade-off between point sources and nonpoint sources. Both contribute phosphorus into Dillon Reservoir, a main source for the Denver area drinking water supply. Historically, the responsiblity for phosphorus control rested solely on the shoulders of the point source dischargers into the reservoir, even though nonpoint source contribution of total phosphorus is more than 10 times the contribution from point sources. The proposed concept would allow a discharger to gain "credit" in their NPDES permit if they can document removal of phosphorus by a nonpoint source control device owned and operated by the discharger. The advantage to the local wastewater entity is that they can avoid the need to invest in expensive and sophisticated additions to their treatment facilities that are already treating to advanced levels. At the same time, water quality standards are being achieved and nonpoint source controls become institutionalized with a built-in incentive for maintenance.

NWCOG and the local sanitation district will be actually constructing and operating nonpoint source control devices at two demonstration sites and monitoring their effectiveness for two years. NWCOG will also sensor negotiations between the local districts and the State to explore ways of incorporating trade-offs in discharge permits.

This project has gotten high visibility in EPA Headquarters, in that it is the only place in the nation where such a trade-off or "bubble" approach to water pollution control is being explored. Essentially, no policy exists for the implementation of point source/nonpoint source trade-offs although it appears the Clean Water Act and regulations do not preclude such an arrangement. It is anticipated that national policy will be developed once the effectiveness of the Dillon Bubble can be demonstrated.

D-4: CLEAN LAKES PROGRAM

Region VIII has participated in the Clean Lakes Program since 1976. To date we have funded twelve Phase I projects, nine Phase II projects and five state classification survey projects. A Phase I project is a diagnostic-feasibility study which determines the problems, evaluates possible solutions and recommends the most feasible program to protect or restore the lake/reservoir's quality. Phase I projects implement the recommendations into operation. The state lake classification study classified, by trophic conditions all the state's public-owned freshwater lake/reservoirs needing restoration and protection. Appendix D, Figure 1. lists and locates the Region's projects.

Since 1980, the clean lakes program has not received consistent funding. Table 1 list the 1983 the clean lakes needs for the limited funding available for 1983, only four projects have passed headquarters initial review. These projects are Sloan's Lake, Colorado, Mirror Lake, North Dakota, Lake Herman, South Dakota and Scofield Reservoir, Utah.

TABLE D-1. REGION VIII 314 CLEAN LAKES PROGRAM
Proposed New Starts
FY 1983

	State	Phase	Total Cost
Cherry Creek Reservoir	CO	II	$1,000,000
Sloans Lake	CO	II	100,000
Dillon Reservoir	CO	II	200,000
Denver Park Lakes	CO	II	100,000
Chatfield Reservoir	CO	II	500,000
Mirror Lake	ND	II	220,000
Wood Lake	ND	II	100,000
Metigoshe Lake	ND	I	100,000
Big Stone Lake	SD	II	500,000
Pelican Lake	SD	I	50,000
Panguitch Lake	UT	II	100,000
Scofield Reservoir	UT	II	100,000
Deer Creek Reservoir	UT	II	300,000
Wall Lake	SD	I	50,000
Pineview Lake	UT	I	100,000
East Canyon Lake	UT	I	50,000
Echo Lake	UT	I	50,000
Rockport Lake	UT	I	50,000
Flaming Gorge Reservoir	WY	II	200,000

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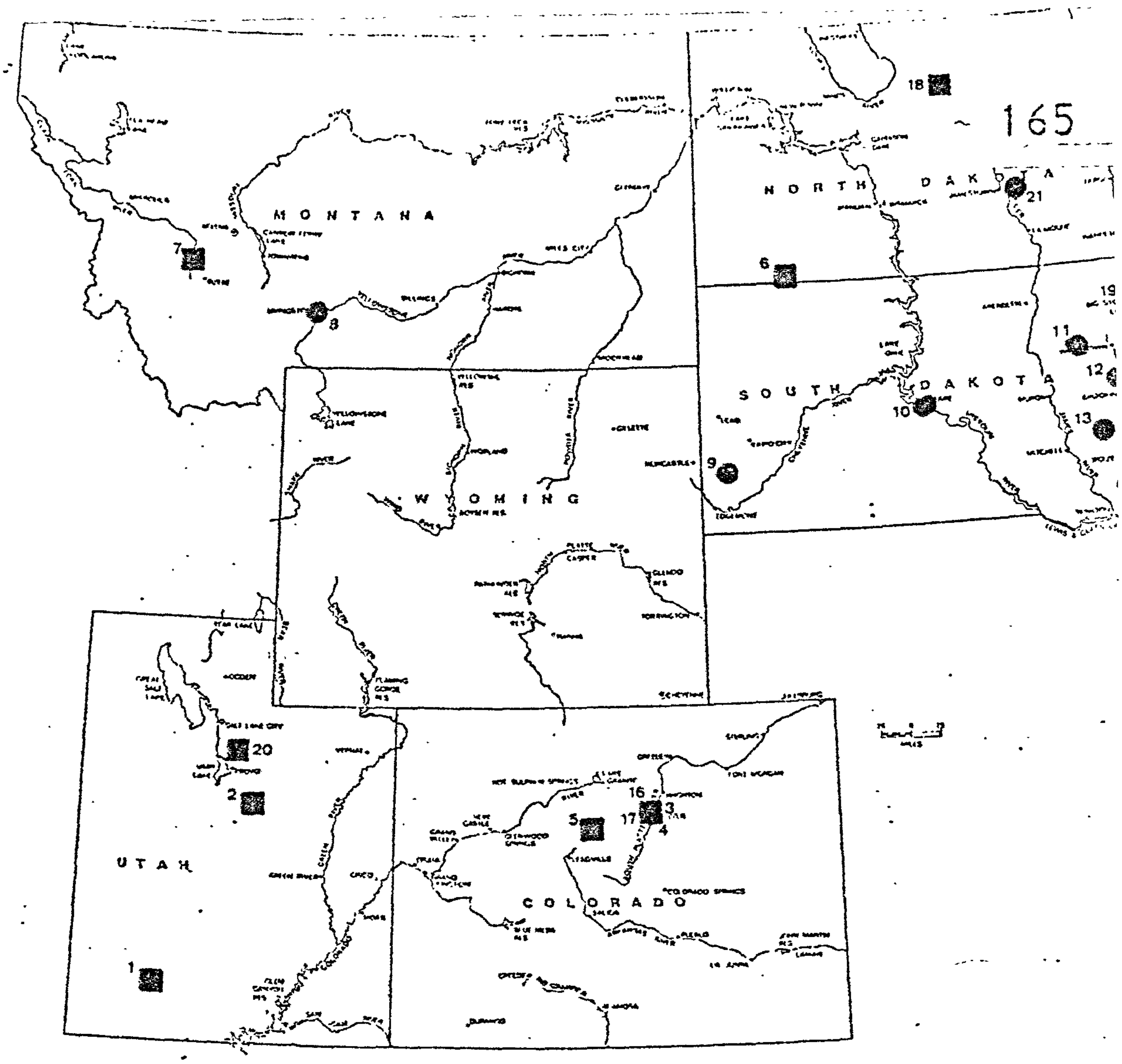


FIGURE D-1 **314 CLEAN LAKES PROGRAM GRANTS**

PHASE I GRANTS	PHASE II GRANTS	CLASSIFICATION GRANTS
1. Panguitch Lake, Utah	8. Sacajawea, Montana	Colorado*
2. Scofield Reservoir, Utah	9. Sylvan Lake, South Dakota	Montana
3. Denver Park Lakes, Colorado	10. Capitol Lake, South Dakota*	North Dakota*
4. Sloan's Lake, Colorado*	11. Lake Kampeska, South Dakota*	South Dakota*
5. Dillon Reservoir, Colorado	12. Oakwood Lakes, South Dakota*	Utah*
6. Mirror Lake, North Dakota	13. Lake Herman, South Dakota	Wyoming*
7. Georgetown Lake, Montana	14. Covell Lake, South Dakota	
16. Chatfield Reservoir, Colorado	15. Swan Lake, South Dakota*	
17. Cherry Creek Reservoir, Colorado	21. Spiritwood Lake, North Dakota	
18. Wood Lake, North Dakota		
19. Big Stone Lake, South Dakota		
20. Deer Creek Reservoir, Utah		

* Completed projects

Drinking Water Quality Section
Environmental Management Report

III.

DRINKING WATER

Part I. Overview of Status and Trends

In Region VIII's six states, there are 3,136 community water systems serving 7,463,000 people and 5,536 non-community water systems serving a non-resident population of approximately 700,000 people. Most of these systems are small and use ground water as a source of supply.

One of the major provisions of the Safe Drinking Water Act of 1974 was to require the establishment and enforcement of national drinking water regulations. The National Interim Primary Drinking Water Regulations established maximum contaminant levels (MCLs) in drinking water supplies for coliform bacteria and some inorganic, organic and radioactive chemicals. Regular monitoring for these contaminants is required of each public water system. In addition, systems serving more than 10,000 people must sample for and control the amount of total trihalomethanes (TTHMs) in their supplies. Any systems using surface water must monitor daily for turbidity.

Active enforcement of these regulations was begun in 1978. Although it was the intent of Congress that each state take primary responsibility (primacy) for the enforcement of the Safe Drinking Water Act, two states in Region VIII have chosen not to do so. The Drinking Water Branch of Region VIII, EPA therefore has primacy for the Safe Drinking Water Act in South Dakota and Wyoming.

During FY '79, there were 634 violations of the maximum contaminant level (MCL) for bacteria throughout the Region. Since that time, these violations have decreased markedly. This trend, due to improved treatment as well as sampling techniques is encouraging as the presence of coliform bacteria in drinking water is an indication of the disease-causing potential of the drinking water. Waterborne outbreaks caused by Giardia organisms in systems not exceeding the bacteria MCL suggest that compliance with this regulation does not guarantee safe drinking water.

A number of systems have been found to exceed the standards set for inorganic chemicals. Over one hundred communities, 3% throughout the region, have been found to be in violation of these standards. Fluoride, for example, has been found in excessive amounts in 76 communities. High levels of nitrate, arsenic, mercury and selenium have also been detected in a few water systems. By increased treatment, blending or changing sources, improvements in some communities' drinking water have been made.

In South Dakota, for example, of the estimated 95 communities in violation of standards, including those for inorganic chemicals, 22 have corrected the problem and 28 have approved preliminary plans to correct their problems. Regionwide the improvement rate is not quite as impressive, as less than 37% of the violating systems have improved.

In Region VIII only 106 systems are large enough to test for trihalomethanes. This group of organic chemicals, suspected carcinogens, have been found in levels higher than the MCL in only 2 systems. More systems are expected to find this chemical as sampling is completed. Removal may necessitate a change in treatment technique.

A random survey performed by EPA's Office of Drinking Water in 1980 on ground water systems found trace levels of trihalomethanes and volatile organics in 56% of communities sampled in Region VIII. This indication of aquifer contamination may have serious implications for Region VIII, as fully 90% of the communities rely on aquifers for their source of water.

Part II. Discussion of Environmental Problems and their Implications for Agency Management

A. Public Health Problems Associated with Small Water Systems

1. The Problem

Region VIII is characterized by its rural nature, having over 7 million people scattered across 578,000 square miles of land; or roughly 13 people per square mile. One third of these people live in cities greater than 100,000, but most of Region VIII is made up of small towns. Seventy percent of the community water systems in the region serve less than 1,000 people; ninety-nine percent of these community water systems serve less than 100,000 people.

State and nationwide studies have shown that small water systems (those serving less than 1,000 people) are the systems which have the most problems in consistently providing safe drinking water. Typically, these systems rely on untreated ground water, unfiltered surface water or poorly protected springs for their source of supply. This, in combination with low water rates that can not support improvements or adequate operation, result in public health dilemmas.

Of all the bacteria violations in FY 82, 35% occurred in systems serving 1,000 or less. As this water served only 4% of the population, this level of violations is disproportionately high.

Unfiltered water sources are a particular problem due to the occurrence of high turbidity during run off periods which interferes with disinfection and increases the presence of chlorine resistant Giardia lamblia cysts. In the past 3 years, 17 outbreaks of giardiasis have occurred in the region, most of them in small systems.

2. Barriers to Solving Problems

The lack of practical treatment technology, alternate sources and available funding make it very difficult for a small water system (even if they wanted) to improve their drinking water. The lack of funds also makes it extremely difficult to hire and retain qualified operating personnel.

B. Inorganic and Radiological Chemical MCL Violations

1. The Problem

Currently there are 86 communities in Region VIII exceeding the fluoride MCL, 33 exceeding the nitrate MCL, 8 exceeding the selenium MCL and 5 communities exceeding the arsenic standard.

These contamination incidents are a result of the presence of natural contaminants in deep aquifers or poor well drilling practices which lead to nitrate contamination.

All of these contaminants are known to have public health implications for the populations consuming them in their drinking water.

2. Barriers to Solving Problems

All of these contaminants can be removed with additional treatment. However, many towns are financially unable or unwilling to finance expensive new treatment methods. The resistance is particularly true in the towns with fluoride violations, as many people do not consider the health effects of fluoride serious enough to warrant new expenditures.

3. Implications for EPA Management

The completion of the revised regulations is necessary. This is particularly true for fluoride, which may be completely removed from the primary regulations.

EPA regional staff should work with the state and other federal agencies to focus existing funding on those systems which have definite public health problems.

C. Unknown Contaminants

1. The Problem

The extent of present contamination of drinking water is only beginning to be discovered. Chemicals for which there are no MCLs, no sampling requirements and in some cases, difficult detection procedures, continue to be discovered in aquifers and surface waters feeding Region VIII drinking water systems. The Office of Drinking Water, in an attempt to determine the occurrence of certain types of chemicals known as Volatile Organic Chemicals (VOCs), performed a survey in 1980 of ground water systems throughout the country. Of the 40 systems sampled in Region VIII, 22 communities were found to contain at least trace amounts of trihalomethanes and VOCs. All but four of these communities had populations of less than 10,000 people. Trihalomethanes and VOCs are thought to be adverse to human health and some are suspected carcinogens.

2. Barriers to Solving Problems

As noted, no regulations exist for these contaminants and detection procedures are quite difficult. Sampling is quite expensive and towns are reluctant to pay for tests that are not required by law. Further, a disbelief by Region VIII consumers that their pristine water supplies could be contaminated makes solving this problem difficult.

D. Drinking Water Quality on Indian Lands

1. The Problem

Numerous Indian tribes have traditionally made their home in the six state region comprising Region VIII. Presently 25 tribes reside on 23 Indian Reservations. Inadequate treatment and little, if any operation and maintenance contribute to the problem of intermittent quality of drinking water on the reservation. Although the number of bacteria MCL violations on the reservations have been low, many operation and treatment deficiencies have been noted during sanitary surveys. Public health problems may result from contaminated drinking water.

2. Barriers to Solving the Problem

Dedicated trained operators are difficult to find on the reservations. Also, the responsibility for public health maintenance on Indian lands is scattered through a number of federal agencies, making it difficult to enforce the Safe Drinking Water Act.

3. Implications for EPA Management

EPA Region VIII must develop a coherent strategy which coordinates all federal agencies involved with Indian lands so that it can enforce a policy that will ensure the delivery of safe drinking water.

Attachment A

I. Population Statistics

Region VIII has an estimated 8,672 public water supplies serving 8,263,000 people throughout the six states of Colorado, Utah, Wyoming, Montana, North and South Dakota (Map 1). This includes 3,136 systems serving communities such as towns and trailer parks. There are also an estimated 5,536 non-community systems serving non-resident populations. These systems include rest stops, motels, restaurants and airports which have their own water systems.

Table 1 shows a breakdown by state of community systems. Over 80% of these systems use ground water as their major source of supply. Further, most of the 5,536 non-community systems use groundwater, bringing the total to well over 90% of the systems. Map 2 shows this breakdown by state. It also gives an indication of the small town nature of Region VIII. Although 90% of the systems use ground water as a source, only 40% of the population are served by these systems. This indicates that most of the ground water systems are very small.

Table 2 shows the population distribution of community systems. Seventy percent of the systems in the region serve less than 5% of the population in towns with less than 500 people. Only 0.2% of the systems serve more than 100,000 people and yet that represents one-third of Region VIII's population.

II. Violation Statistics

A. Coliform Bacteria (Microbiological)

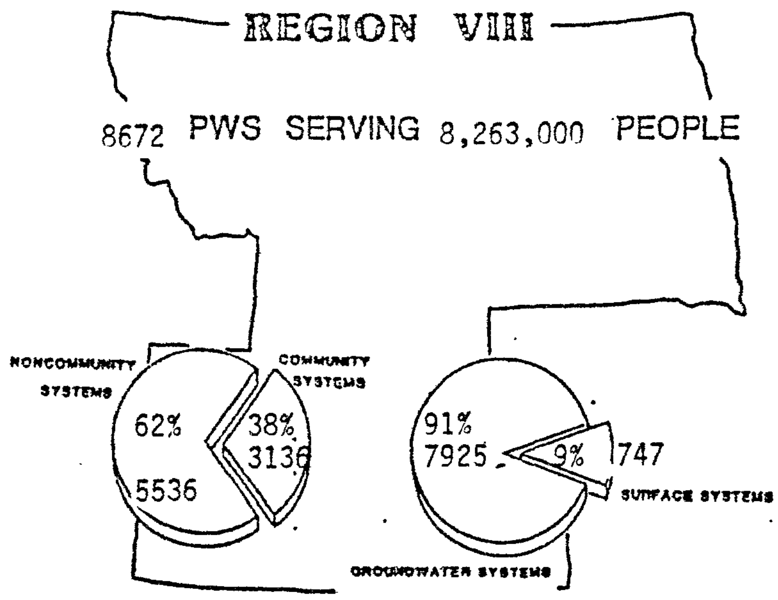
Throughout the region, coliform bacteria violations, both MCL and monitoring and reporting violations, have decreased between October 1978 and the present. Graph I shows this trend for community water systems from October 1978 through the end of the 1982 fiscal year. The graph also indicates that the number of monitoring violations is quite a bit higher than the number of MCL violations. In fiscal year 1981, 30% of the systems failed at some time to either monitor or report a violation.

What is of more concern than simply the number of violations, is the number of systems that are considered persistent violators. These systems violate the bacteria standard for 4 or more months in a year or more than one quarter in a calendar year.

Graph 2 shows the compliance of community systems with the coliform bacteria regulations from FY 1979 through FY 1982, indicating the percentage of these systems which are persistent violators. As is shown, the compliance rate has increased from 54% in 1979 to 68% in 1982. The percentage of persistent violators has similarly decreased from 19% to a 1982 level of 10%. However this still represents a sizable portion of the systems which are consistently out of compliance.

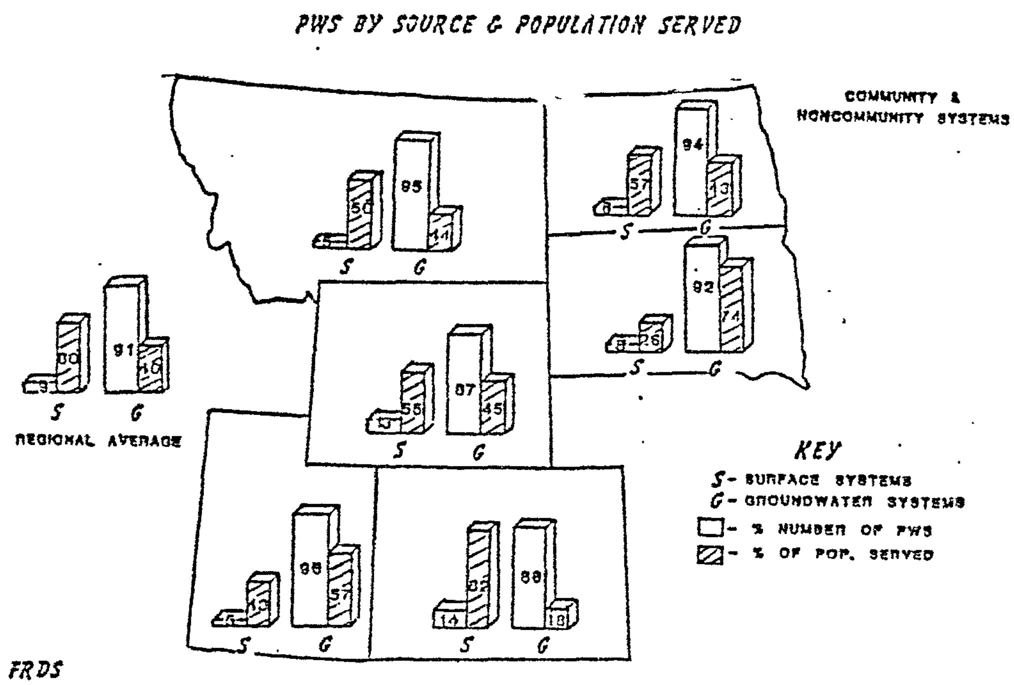
Graph 3 breaks the microbiological violations down into MCL and monitoring and reporting violations. Again, there has been a trend since 1979 toward compliance, but a substantial percentage of systems are persistent violators.

Map 1,



FRDS DATA

Map 2.



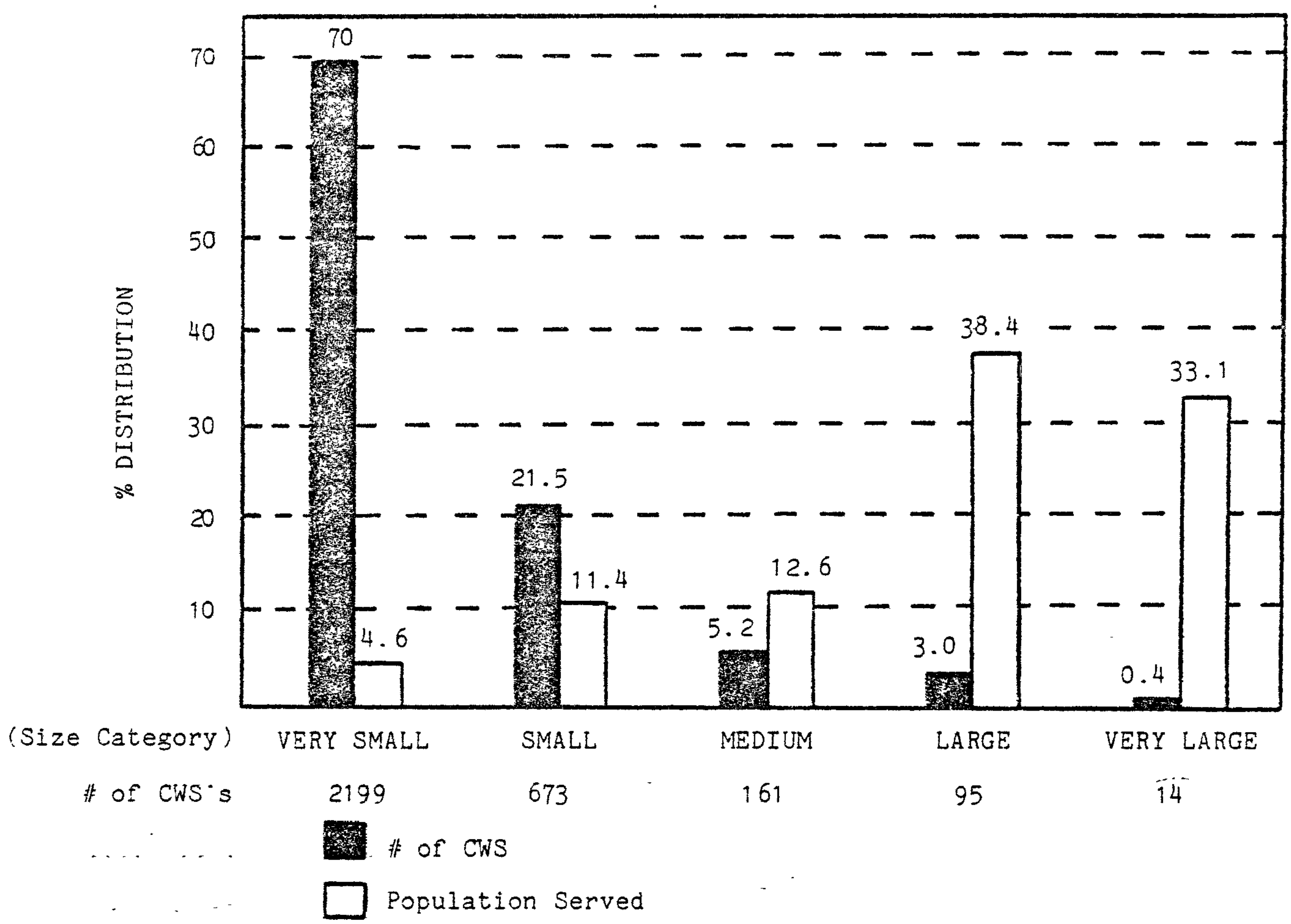
FRDS

COMMUNITY WATER SUPPLIES IN STATES FY 1982

STATE	SIZE CATEGORY					TOTAL	SOURCE TYPE	
	V-S	S	M	L	V-L		SURFACE	GROUND
CO	585	192	51	33	4	865	228	637
MT	511	82	17	8	0	618	72	546
ND	220	107	15	10	0	352	36	316
SD	300	111	19	8	0	438	42	396
UT	218	127	35	31	4	415	87	328
WY	243	48	17	7	0	315	64	251
REG VIII	2077	667	154	97	8	3003	529	2474
% IN REG	69.16	22.21	5.13	3.23	0.27		17.62	82.38

TABLE 1. POPULATION BREAKDOWN OF COMMUNITY SYSTEMS

TABLE 2. SIZE DISTRIBUTION OF CWS's IN REGION VIII



SYSTEM SIZE CATEGORIES

SIZE	POPULATION SERVED
VERY SMALL	25 - 500
SMALL	501 - 3,300
MEDIUM	3,301 - 10,000
LARGE	10,000 - 100,000
VERY LARGE	GREATER THAN 100,000

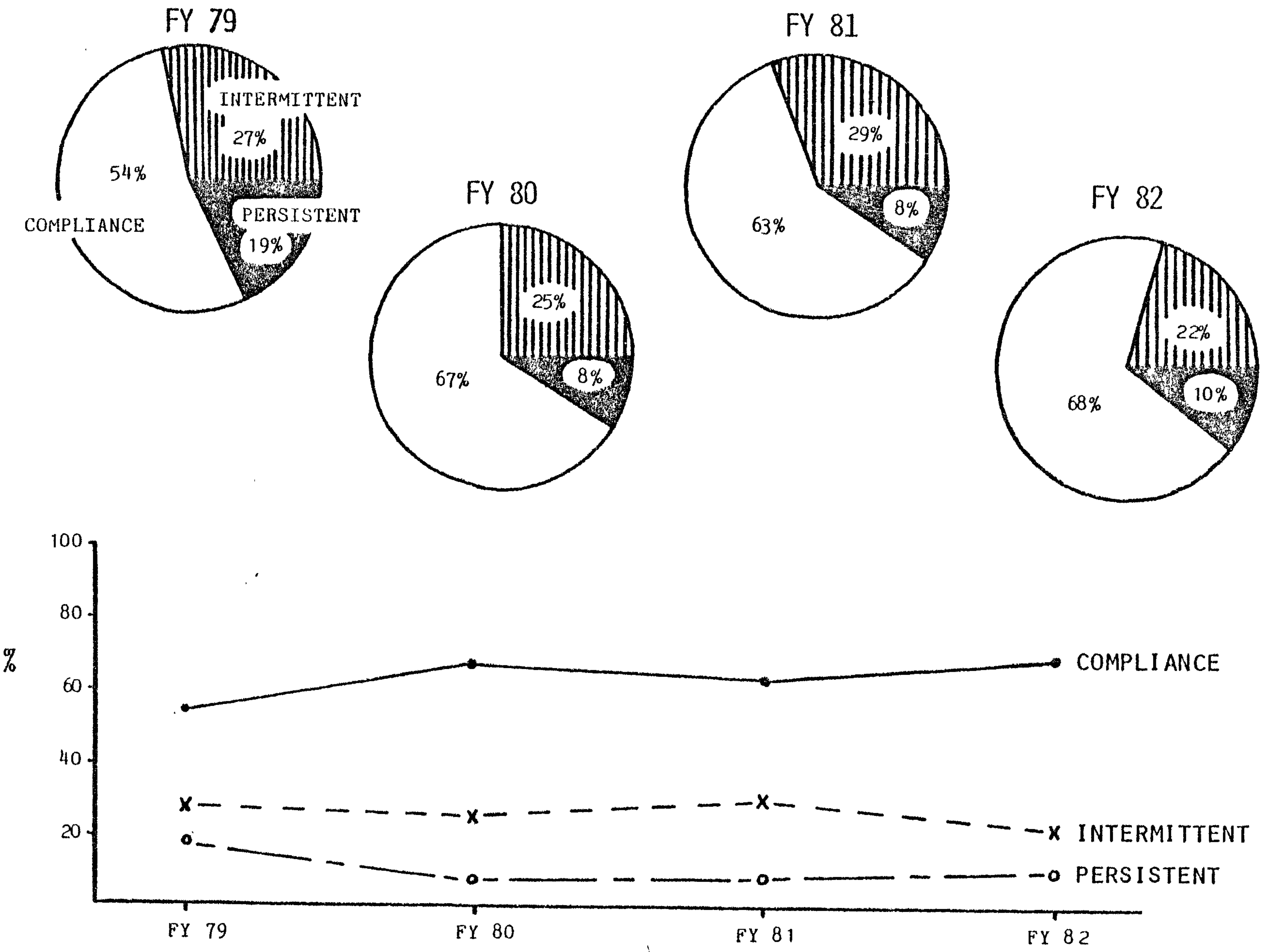
GRAPH 1

Compliance Comparison for Microbiological Violations
(BY % SYSTEMS IN VIOLATION)

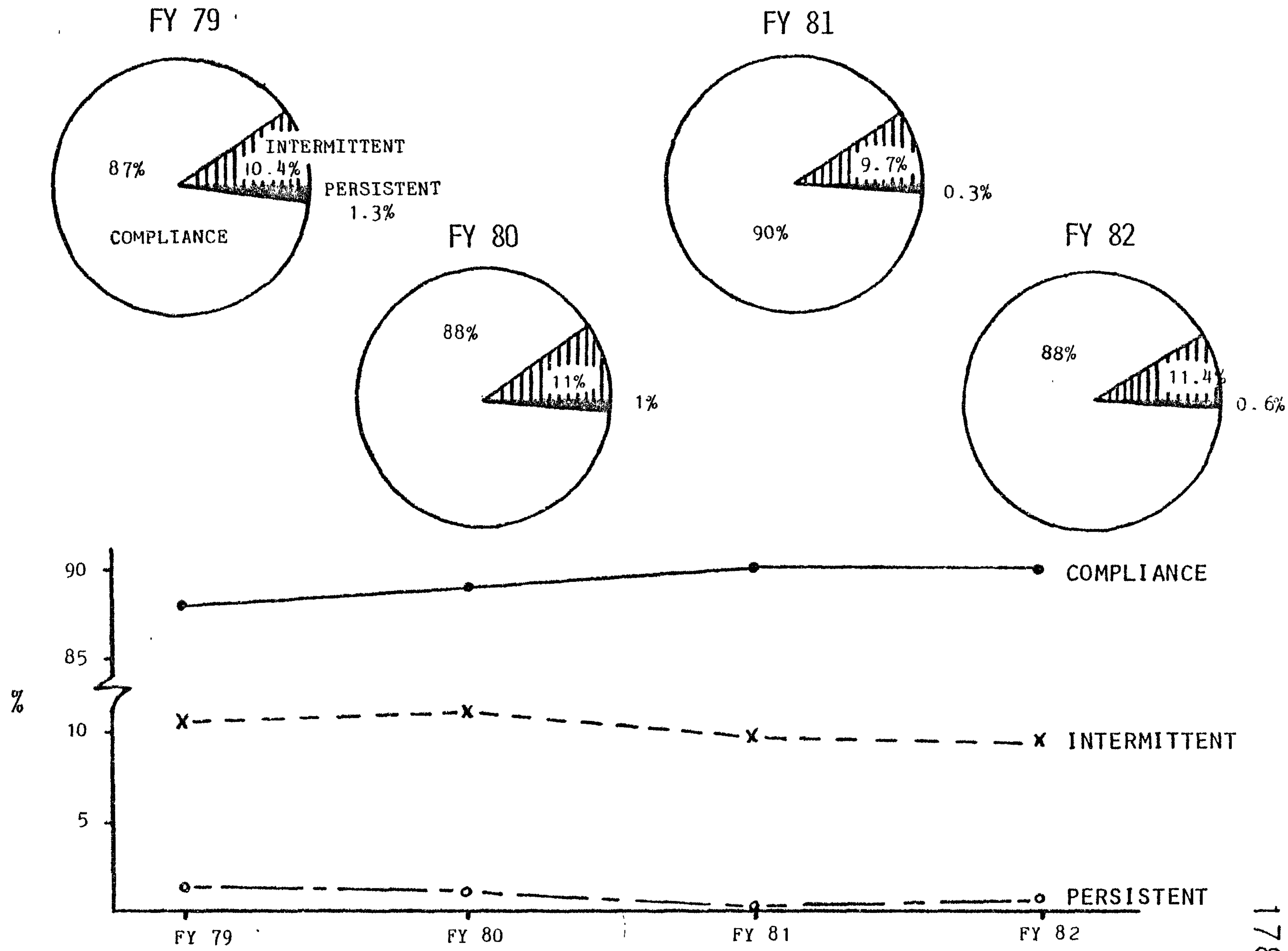
State	MCL				M/R			
	FY79*	FY80	FY81	FY82	FY79*	FY80	FY81	FY82
CO	0.4	5.3	2.0	2.8	35.8	25.3	30.0	16.5
MT	12.2	9.8	6.2	9.7	30.9	15.8	43.5	44.8
ND	10.1	11.5	6.0	13.1	41.5	26.6	24.3	17.1
SD	11.8	7.2	8.3	5.5	30.4	25.2	32.6	33.1
UT	37.3	26.6	40.1	43.6	56.1	8.0	15.0	72.1
WY	20.1	15.9	9.9	7.3	74.6	37.6	29.7	30.5
Regional Average	12.9	11.3	10.3	11.9	41.1	22.7	30.6	34.0

* NOT UPDATE TO FY83 DURATION UPDATE.

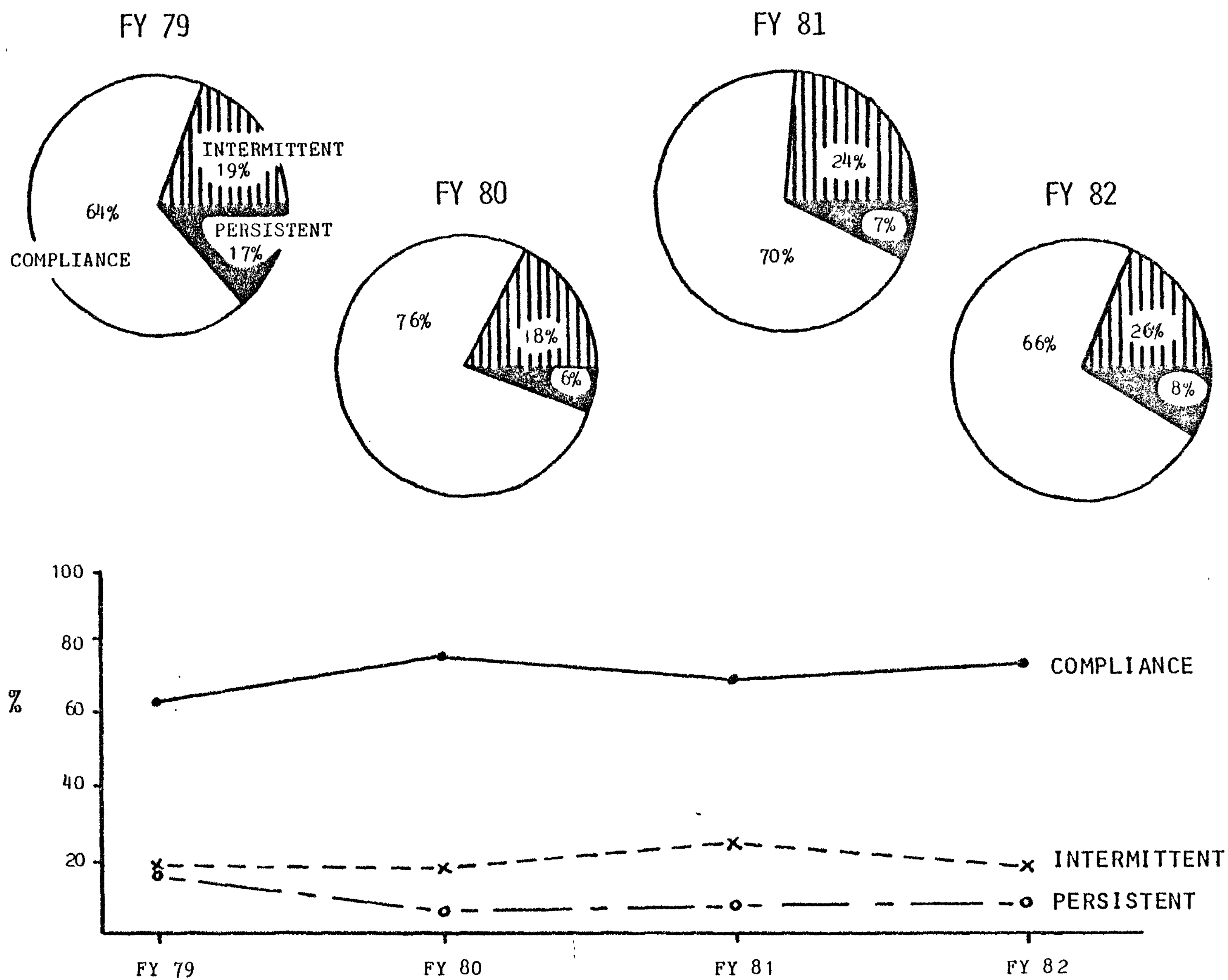
GRAPH 2. REGION VIII MICROBIOLOGICAL COMPLIANCE



GRAPH 3. REGION VIII MICROBIOLOGICAL MCL COMPLIANCE



GRAPH 4. REGION VIII MICROBIOLOGICAL MONITORING AND REPORTING COMPLIANCE



Over all, in FY 1982, 88% of the systems were in compliance with the MCL portion of the bacteria standard. Eleven percent were intermittent violators and 0.6% were persistent violators. Since 1979, compliance has improved. This improvement included an encouraging trend in the reduction of persistent violators. During FY 82, less than 1% of all systems were persistent violators of the bacteria MCL regulation.

The bacteria monitoring and reporting data has also shown improvement between the years 1979 and 1982. Compliance has improved by 2%, but perhaps more significantly, persistent violators have been reduced by 9%. However, in 1982, 34% of all systems were still in violation of the bacteria monitoring and reporting data, indicating that there is still much room for improvement.

B. Turbidity Compliance

Graph 4 shows a breakdown of regional turbidity compliance. In FY 1979, 81% of the surface waters in the region met all the requirements of the turbidity regulations. Persistent violators represented 9% of all systems.

Compliance has improved. In FY 1982, 89% of the systems were in compliance, and the percentage of persistent violators was decreased to 5%.

C. Inorganic and Radiological Chemical Compliance

Table 2 shows the number of communities in the Region in violation of the inorganic chemical MCLs. A total of 132 systems do not meet the standards set for inorganic chemicals including nitrate, fluoride, selenium and arsenic.

Table 2 also shows 24 violations of the rad standard. However, sampling in some states has not been completed and the actual number of systems in violation will probably be much higher.

D. THM and Organic Chemicals Compliance

As noted earlier, only 2 systems in the region have found levels of THMs in excess of the MCL. However, sampling is not yet complete for systems serving 10,000 - 100,000 people, and more violations are expected to be discovered.

In an attempt to determine the extent of occurrence of volatile organic chemicals in ground water systems, the Office of Drinking Water conducted a study of ground water sources throughout the country in 1980. A list of the volatile organic chemicals tested for and the levels detected in public water systems is included on Table 4. A further breakdown of the occurrence of these organics as well as trihalomethanes in systems tested in Region VIII is included in Table 5.

Although the number of systems tested for in this region is too low (39), to make substantive conclusions from this data, the results may be an indication of widespread contamination of some of the Region VIII aquifers.

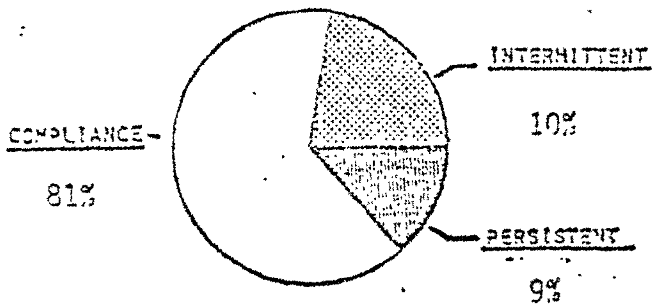
Table 5 shows the breakdown of results from Region VIII systems. Over half of the samples tested contained trace amounts of either trihalomethanes or volatile organic chemicals. Eighteen percent of the systems contained only trace amounts of volatile organics. This is slightly better than the national average of 24%.

Graph 5
Region VIII, Turbidity Compliance

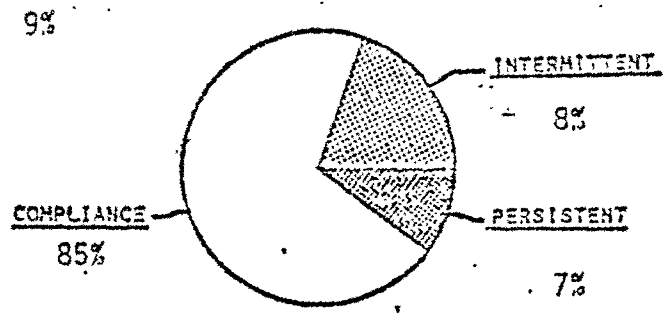
- 181

Graph 5

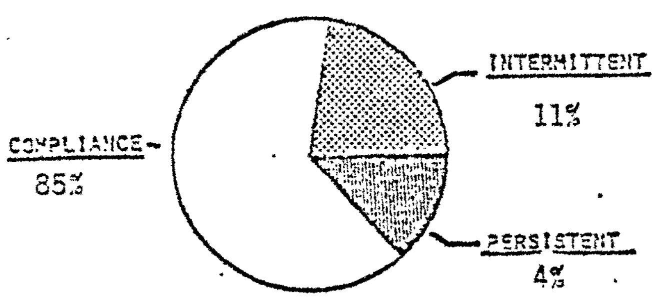
Region VIII
Turbidity Compliance



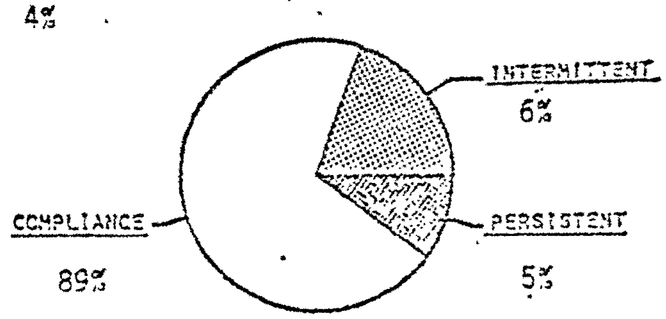
FY 79



FY 80



FY 81



FY 82

Table 3

Inorganic and Radiological Chemical
MCL Violations

	Nitrate	Fluoride	Selenium	Arsenic	Rad*
UT	1	0	0	0	0
SD	8	29	4	0	9
ND	1	27	0	1	0
WY	2	2	1	0	4
MT	11	18	0	2	5 (226)
CO	10	10	3	2	6 (?)
TOTAL	33	86	8	5	24

* All samples have not been adequately analyzed. It is expected that many more systems will be in violation.

Table 4

Ground Water Supply Survey
December 1980 - December 1981

Summary of Volatile Organic Chemical Occurrence Data from
466 Public Water System Selected at
Random in the USA
(Trihalomethane data has been omitted)

Parameter	Quantitation Limit ug/l	Occurrences	Maximum Value Detected-ug/l
vinyl choride	1.0	1	1.1
1,1-dichloroethylene	0.2	9	6.3
1,1-dichloroethane	0.2	18	3.2
cis and/or trans-1,2-dichloroethylene	0.2	16	2.0
1,2-dichloroethane	0.5	3	0.95
1,1,1-trichloroethane	0.2	27	18
carbon tetrachloride	0.2	15	16
1,2-dichloropropane	0.2	6	21
trichloroethylene	0.2	30	78
tetrachloroethylene	0.2	34	23
benzene	0.5	3	15
toluene	0.5	6	2.9
ethylbenzene	0.5	3	1.1
bromobenzene	0.5	4	5.8
m-xylene	0.2	8	1.5
o+p-xylene	0.2	8	.91
p-dichlorobenzene	0.5	5	1.3
1,1,2-trichloroethane	0.5	0	-
1,1,1,2-tetrachloroethane	0.2	0	-
1,1,2,2-tetrachloroethane	0.5	0	-
chlorobenzene	0.5	0	-
1,2-dibromo-3-chloropropane	5.0	1	5.5
n-propylbenzene	0.5	0	-
o-chlorotoluene	0.5	0	-
p-chlorotoluene	0.5	0	-
m-dichlorobenzene	0.5	0	-
o-dichlorobenzene	0.5	0	-
styrene	0.5	0	-
isopropylbenzene	0.5	0	-

The samples were also analyzed for trihalomethanes, chloroform, bromoiodomethanes, bromodichloromethane, dibromochloromethane and bromoform, but the results of these analyses were not included in the final study.

Table 5

Occurrence of Volatile Organic Chemicals and
Trihalomethanes in Random and Selected Samples
From 39 Public Water Systems in Region VIII

Random Samples		% of Systems With VOC's Detected	% of Systems With VOC's and THM's Detected
Populations	10,000	23%	39%
Populations	10,000	50%	75%
Selected Samples			
Pop.	10,000	11%	58%
Pop.	10,000	0%	67%

Totals

Systems with THM's or VOC's . . . 54%

Systems with VOC's Detected . . . 18%

ATTACHMENT B

1. List of South Dakota Systems

SOUTH DAKOTA
Water System Improvements
1978 through 1982

TOWN	POPULATION	LEVEL/TYPE CONTAMINANT	SOLUTION
Baltic	679	11.6 mg/l NO_3^-	Minnehaha Rural Water
Bryant	380	4.1 mg/l F^-	Sioux Rural Water
Dupree	562	3.5 mg/l F^-	Tri-County Rural Water
Eagle Butte	435	>2.4 mg/l F^-	Tri-County Rural Water
Egan	248	29.0 mg/l NO_3^-	New Well
Fairfax	225	22.0 ug/l Se	East Gregory Rural Water
Faith	576	Turbidity	Tri-County Rural Water
Gann Valley	75	2.5 mg/l F^-	Aurora-Brule Rural Water
Huron	13,000	TTHMs	Change in treatment
Kimball	752	2.8 mg/l F^-	Aurora-Brule Rural Water
Lesterville	156	88.0 ug/l Arsenic	B-Y Phase II Rural Water
Midland	277	15.0 pCi/l Radium	New $BaCl_2$ treatment plant
Mission Hill	197	>2.4 mg/l F^-	B-Y Phase I Rural Water
Gettysburg	1,623	>2.4 mg/l F^-	New treatment plant
Oacoma	289	2.5 mg/l F^-	New treatment plant
Platte	1,334	>2.4 mg/l F^-	Randall III Rural Water
Pukwana	234	2.8 mg/l F^-	Aurora-Brule Rural Water
Utica	100	2.7 mg/l F^-	B-Y Phase I Rural Water
Volin	156	>2.4 mg/l F^-	B-Y Phase I Rural Water
White Lake	414	>2.4 mg/l F^-	Aurora-Brule Rural Water
Witten	164	>2.4 mg/l F^-	Tripp Rural Water
Roscoe	370	2.7 mg/l F^-	New source
TOTAL POPULATION AFFECTED	22,246		

SOUTH DAKOTA

Water System Improvements
Planned Projects

TOWN	POPULATION	LEVEL/TYPE CONTAMINANT	SOLUTION	PROPOSED DATE
Mound City	111	3.1 mg/l F^-	WEB Rural Water	January 1985 (estimate)
Doland	381	3.0 mg/l F^-	" " "	"
Redfield	3,027	2.5 mg/l F^-	" " "	"
Rockham	52	3.1 mg/l F^-	" " "	"
Orient	87	2.8 mg/l F^-	" " "	"
Northville	138	3.4 mg/l F^-	" " "	"
Mellette	192	2.8 mg/l F^-	" " "	"
Brentford	92	2.5 mg/l F^- 17.0 ug/l Se	" " "	"
Conde	259	3.8 mg/l F^-	" " "	"
Ferney	51	3.3 mg/l F^-	" " "	"
Amherst	75	6.9 mg/l F^-	" " "	"
Ipswich	1,153	3.0 mg/l F^-	" " "	"
Bath Trailer	100	3.5 mg/l F^-	" " "	"
Zell	69	>2.4 mg/l F^-	" " "	"
Reliance	190	2.6 mg/l F^-	Connect to Oacoma	
Claremont	180	4.3 mg/l F^-	BDM Rural Water	
Langford	307	6.7 mg/l F^-	BDM Rural Water	
Dallas	199	29.6 mg/l NO_3^-	Tripp Rural Water	Summer 1983
Fairview	90	22.8 mg/l NO_3^-	New well (HUD funds)	Spring 1983
Elkton	632	26.0 mg/l NO_3^-	New well	
Philip	1,088	10.0 pCi/l Radium	Modify plant (HUD funds)	

Menno	793	7.0 pCi/l-Radium	B-Y Rural Water	
Humboldt	487	5.4 pCi/l Radium	Minnehaha Rural Water	
Raymond	106	5.4 mg/l F^-	Clark Rural Water	
Draper	138	3.0 mg/l F^-	West River Aqueduct or Lyman-Jones Rural Water	
Wolsey	437	>2.4 mg/l F^-	North Beadle-Southern Spink Rural Water	
Quinn	80	3.2 mg/l F^-	Lyman-Jones Rural Water	
Gregory	1,503	16.5 mg/l NO_3^-	New source	Fall 1983
TOTAL POPULATION AFFECTED	12,017			

B. 2. Waterborne Transmission of Giardiasis

For a number of reasons, the Rocky Mountain area is particularly susceptible to outbreaks of giardiasis, caused by the pathogen Giardia lamblia. Heavy use of Colorado watersheds, ready access to surface water supplies and little or no treatment of these surface water supplies have all contributed to the high number of outbreaks. In most of the communities that have experienced outbreaks, surface water has been used with no treatment or with inadequate filtration.

Outbreaks of the disease have occurred in Colorado, Utah, Montana and Wyoming. The number of outbreaks reported in Colorado has been particularly high, due in part to the increased surveillance for this disease. Eleven outbreaks have been documented in Colorado. Seven of these occurred during the period between spring of 1980 and spring of 1982 when an EPA/Center for Disease Control-sponsored waterborne disease surveillance program was carried out by the Colorado Department of Health.

Giardiasis is characterized by diarrhea, weakness, weight loss and fever. It has never caused a fatality, but it is still considered a significant problem.

IV.

Ground Water Quality Section
Environmental Management Report

REGION VIII EMR
GROUND WATER PROTECTION MEDIUM

Part I. Introduction - Overview of Status and Trends

A. Region VIII Ground Water Use

In the region's six states, there are 3,136 community water systems and 5,536 non-community water systems of which over 90 percent obtain all or part of their supplies from ground water aquifers. Approximately 95 percent of the region's population in the rural areas obtain their sole water supply from private wells.

The region's aquifers include: 1) the Central and Great Basin carbonate formations 2) the sandstone aquifers 3) the alluvial aquifers adjacent to stream valleys 4) the semi-consolidated sands and siltstones ,5) the fractured granitic, metamorphic and volcanic rock aquifers of the Central Rockies and 6) glacial drift aquifers.

The Central and Great Basin carbonate formations (limestones and dolomites) usually have "hard waters" containing naturally high inorganic concentrations, some of which are of health concern, such as fluoride, selenium, uranium and arsenic. The sandstone aquifers, including the massive Dakota Sandstone and the complex folded and faulted sandstone deposits on either side of the Rocky Mountains, often contain waters of high quality, especially near their mountain recharge zones. The alluvial aquifers, stream erosional features, are tied to the stream flow and thus reflect the stream quality which varies from high mountain pristine conditions to alluvial waters degraded by municipal, industrial, agricultural and mining operations. It is these shallow, highly developed areas where most of the region's 31 hazardous waste and 38 solid waste sites suspected of ground water pollution are located. (Abandoned solid waste sites are not readily locatable and have not been inventoried.) The fractured granitic metamorphic and volcanic rock aquifers of the Central Rockies which, although limited in quantity, supply the only source for many of the region's mountain villages. Due to their limited dilutional capacity and thin overlying soils, these aquifers are readily contaminated from septic wastes or hazardous waste spills. The glacial drift aquifers in the eastern half of the Dakota plains often contain such high concentrations of inorganic solids they are little used, though they provide locally important agriculture and mining supplies.

B. Trends in Ground Water Quality

A survey conducted on a random sample of ground water systems in the Region in 1980 found traces of trihalomethanes and volatile organics in 56 percent of the community well systems. The regional agricultural areas suffer from saline increases due to irrigation practices notably in the Grand Valley, Uncompahgre Valley, the Arkansas Valley of Colorado, and the northeastern plains of Colorado in the Ogallala Aquifer and the Uinta Valley of Utah. Increasing concentrations of nitrates occur in the Big Sioux Valley of South Dakota and the South Platte Valley of Colorado as a result of agriculture practices, municipal waste discharges, and old landfills in the floodplain.

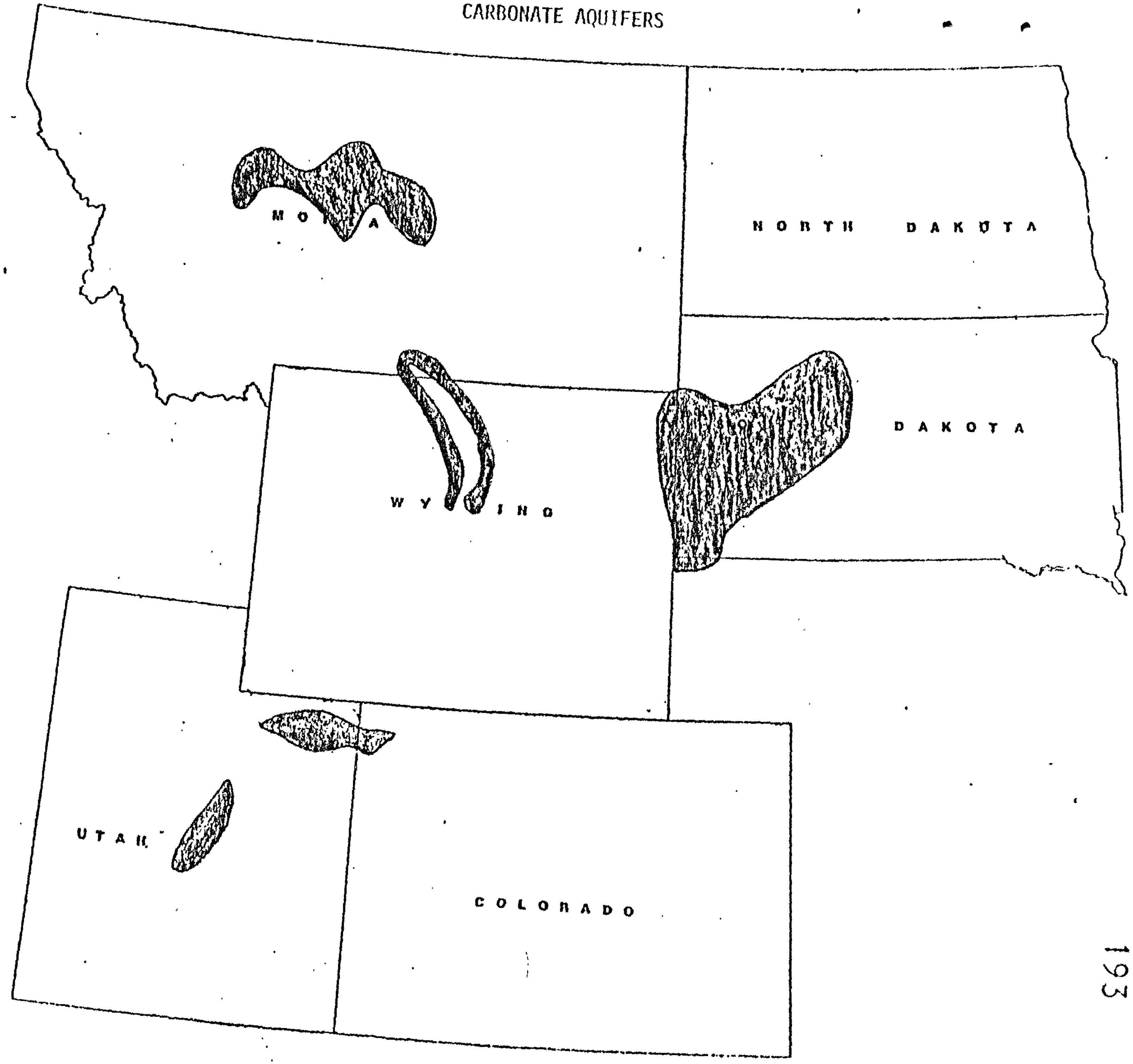
Uranium concentrations are naturally high and thought to be increasing due to land use related activities along the North and South Platte basins of Colorado and Wyoming. Regional mining activities are adding heavy metals and salinity to the ground waters to the extent that several community wells have been abandoned in the Jordan River Valley of Utah as a result of salt increases suspected to be from the adjacent copper mining activity. High selenium, fluoride and uranium concentrations in the western portion of South Dakota, eastern Wyoming and northeastern Colorado caused by natural conditions pose some long term health risks. Local "hot spots" due to hazardous wastes, solid waste, leaking underground tanks, injection of oil and gas brines, acid mine drainage, and accidental industrial spills all pose health risks for small isolated areas in the Region.

Despite these problems, few instances of waterborne disease or chemical poisoning due to contaminated ground water have been reported in the Region. This is due to the fact that any reduced health effects as a result of low level exposure to organic and inorganic constituents are not reported, (and such exposure takes several decades to develop in the exposed population). Some of the risk, (such as nitrate exposure by pregnant women) is avoided by using bottled water and the hazardous waste contamination usually does not occur in areas of ground water use and is thus avoided. The latter is due either to isolation of such disposal sites from the population, the generally deep aquifers in the Region not readily susceptible to contamination or the location of these facilities, which may release contaminated leachates to shallow alluvial aquifers but which then flow directly to streams.

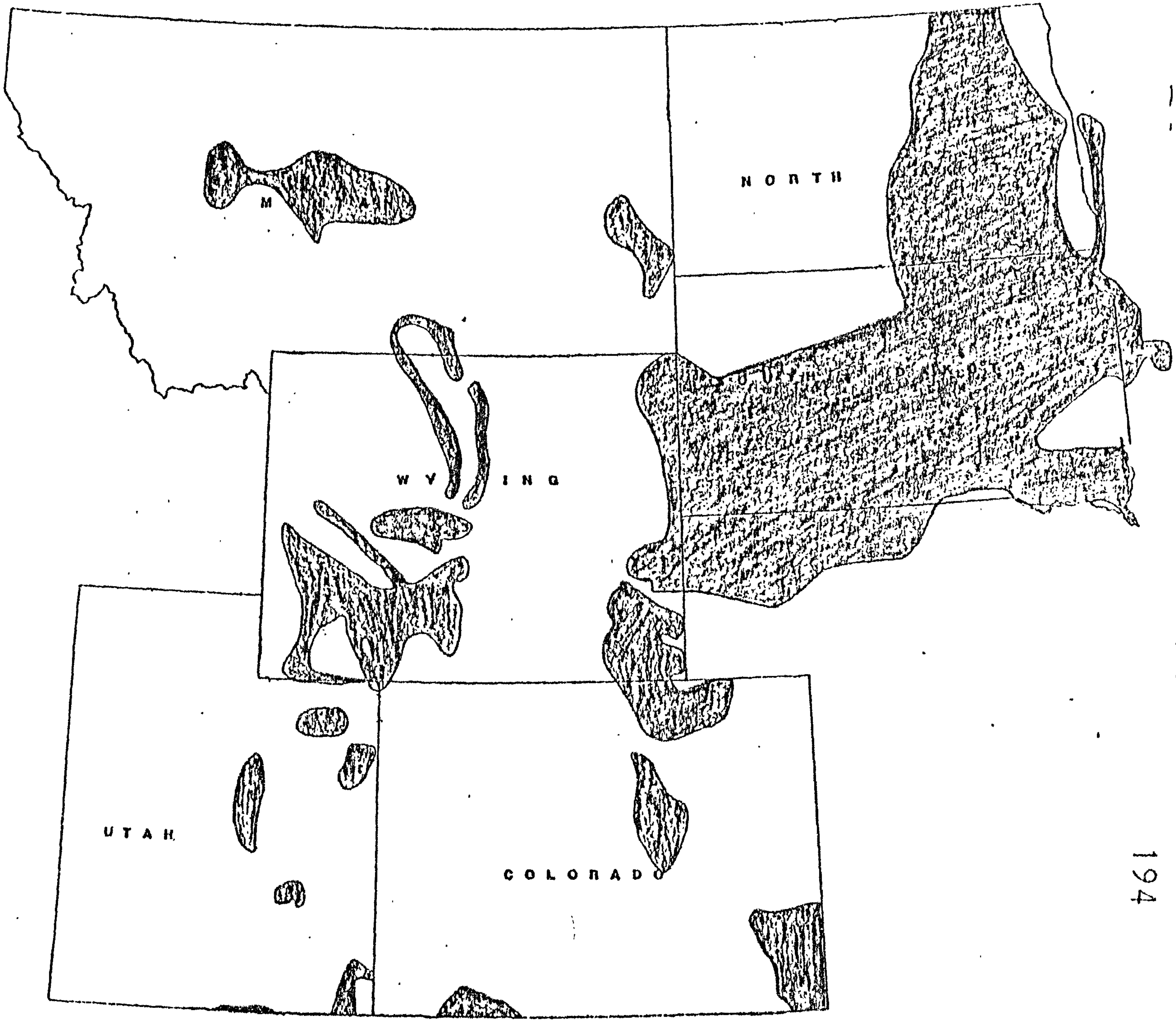
The following maps of the regional aquifer locations are for the purposes of identifying these ground water resources in a very general manner. They should not be utilized for specific reference due their scale and the approximate location of boundaries. The complex folded and faulted geology along the Rocky Mountain uplift, the Central Basin and the Basin and Range Province and the Overthrust Belt in Utah, Wyoming and Montana are too detailed to understand on a map of this scale. As an example, the State of Wyoming reports that since many aquifers are not contiguous across valleys, the number of currently used aquifers in that state is close to one thousand different strata.

Consult with the State Geological Survey, State Engineer's Office and the environmental health organization in each state for detailed aquifer locations.

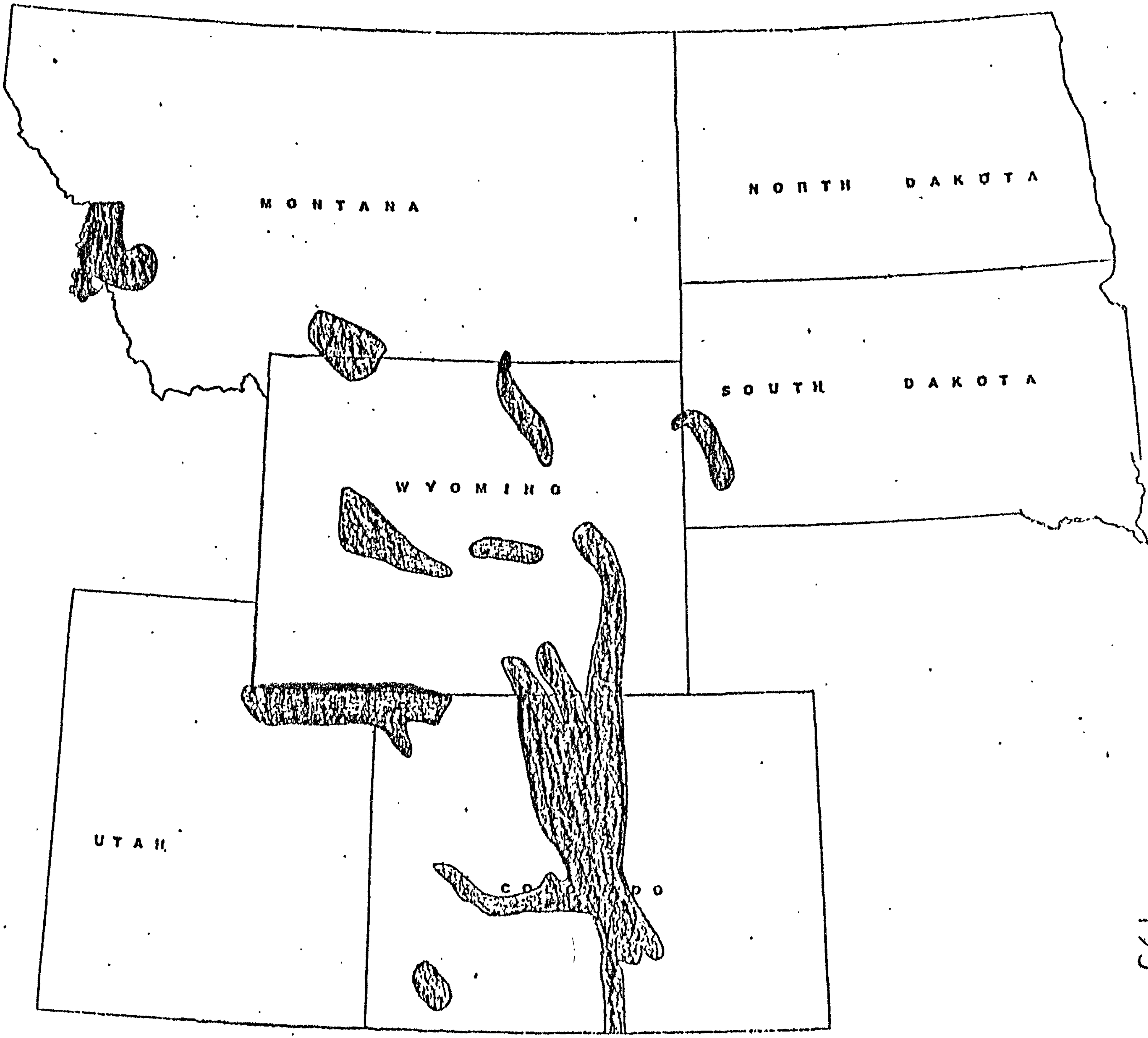
CARBONATE AQUIFERS



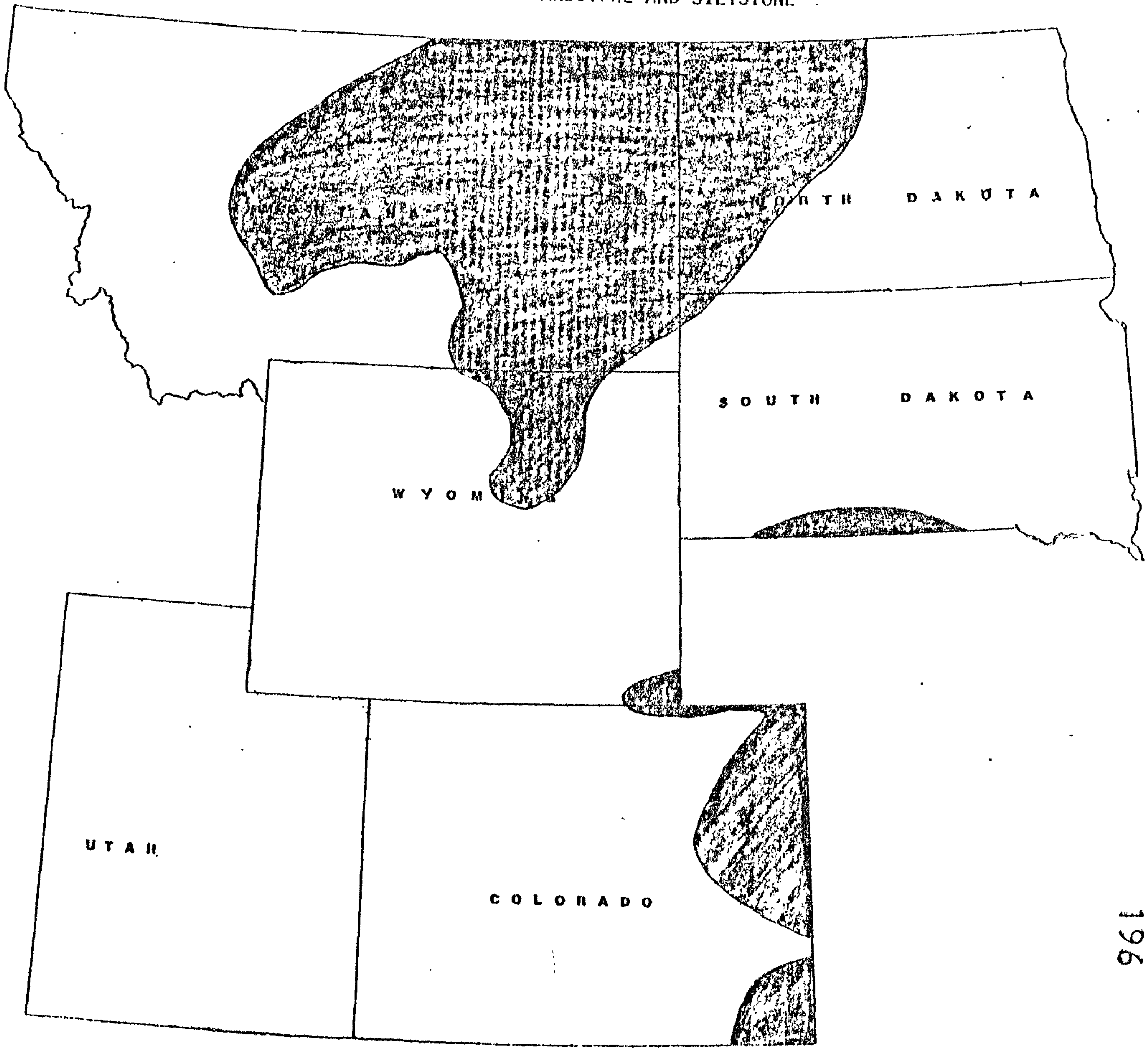
SANDSTONE AQUIFERS



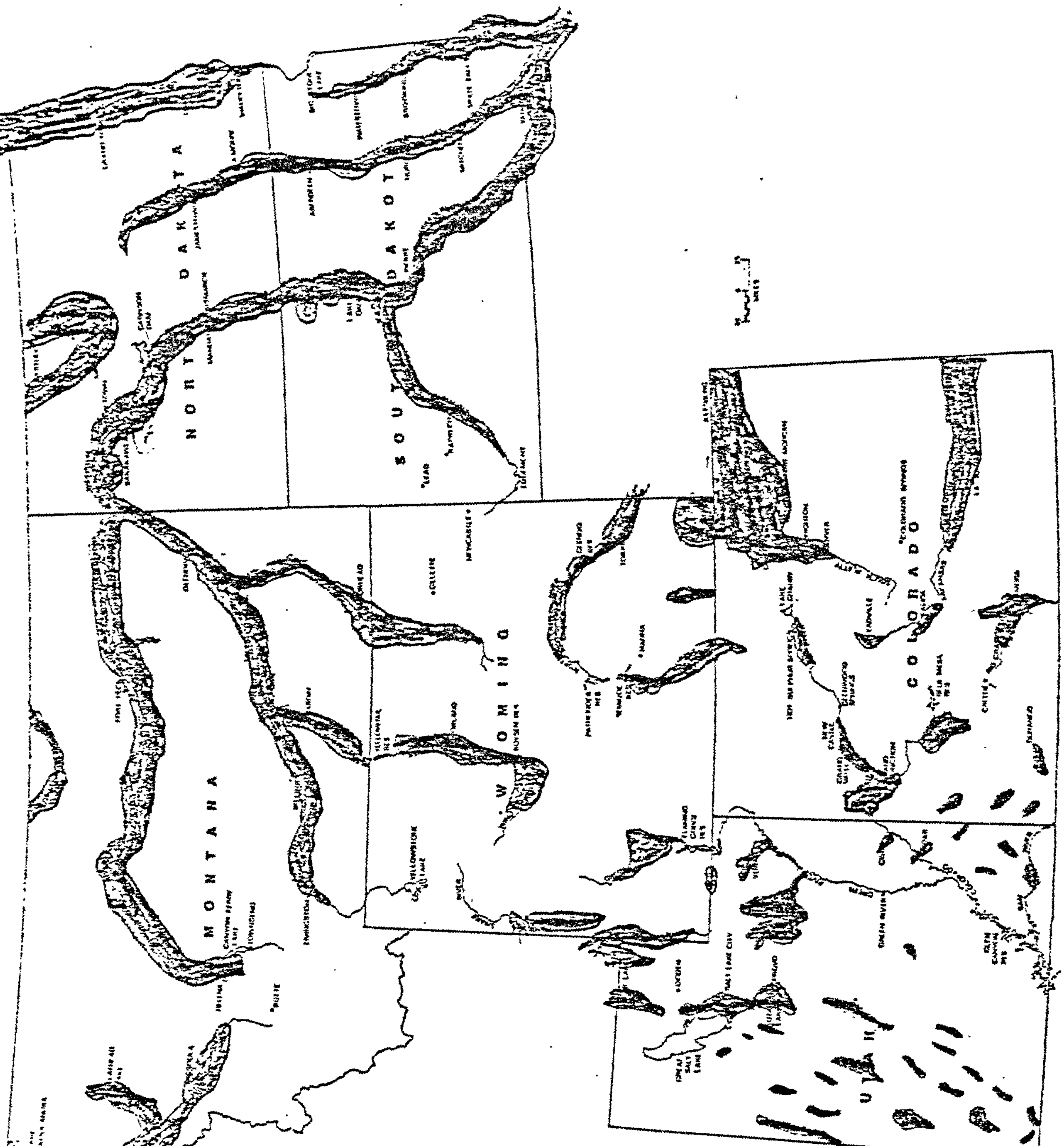
IGNEOUS, METAMORPHIC AND VOLCANIC AQUIFERS



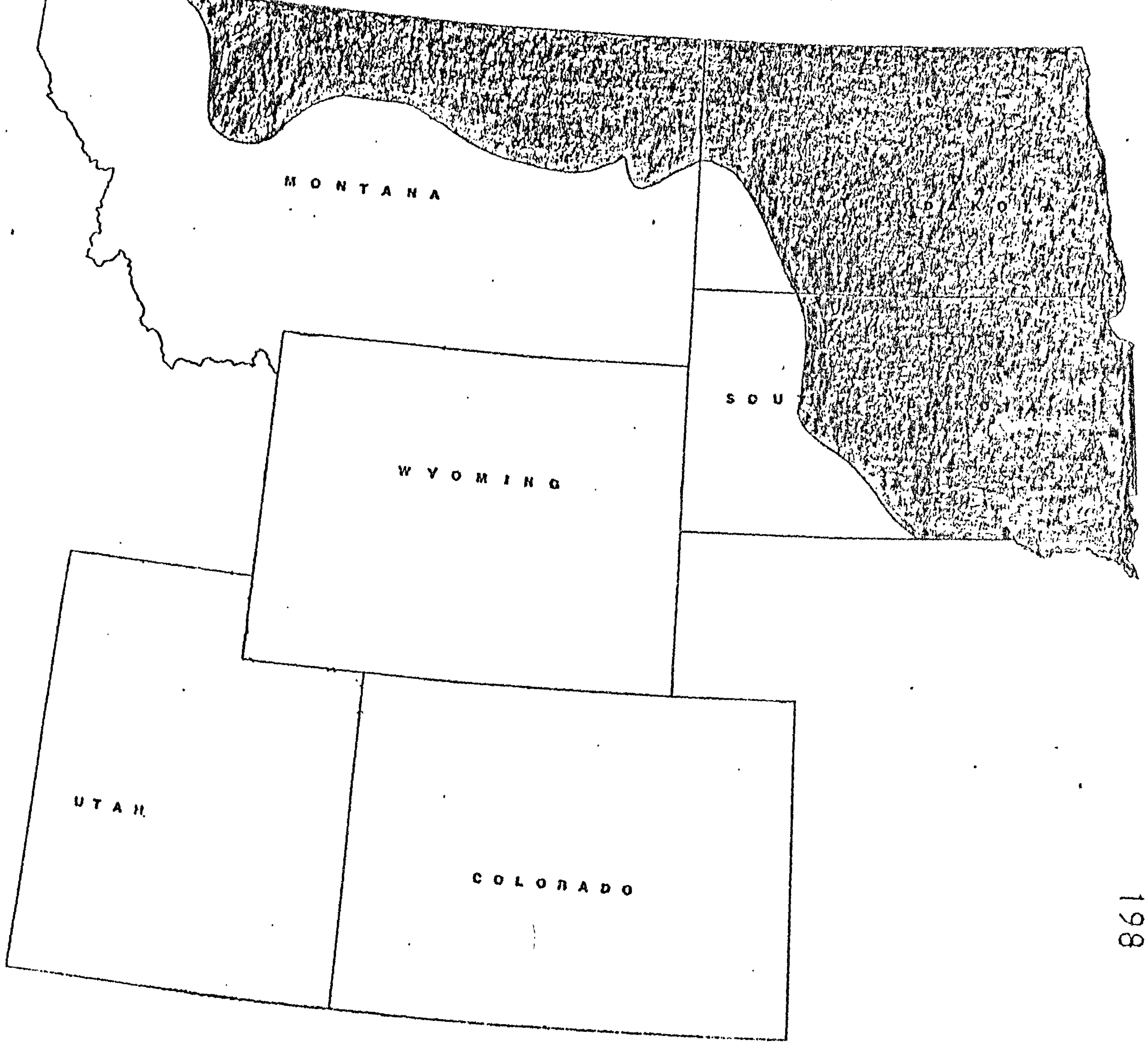
SEMI-CONSOLIDATED SANDSTONE AND SILTSTONE



STREAM ALLUVIUM AND VALLEY FILL



GLACIAL DRIFT AQUIFERS



Part II. Regional Overview of Ground Water Protection Activities

Region VIII activities to protect ground water resources for beneficial use, primarily drinking water, include activities under seven separate legislative requirements. These include:

1. The Safe Drinking Water Act -- Under the SDWA the regional office oversees and assists the public water system program for four states and directly implements the program for the states of South Dakota and Wyoming. Key issues under this aspect of the SDWA program include monitoring and reporting for inorganic pollutants, investigation of potential contamination and protection of the aquifers. The region also administers the Sole Source Aquifer Program under Section 1424 of the SDWA. To date no sole source aquifers have been designated in the region. A study of the Big Sioux Aquifer in South Dakota is underway to determine if the state should request that EPA designate it as a sole source. An emerging program soon to begin in four states is the permitting requirements of the Underground Injection Control program. Utah and Wyoming have been delegated by the region to administer the UIC program; North and South Dakota will receive delegation shortly. EPA Region VIII intends to administer the UIC program in Colorado and Montana. The key issue in the region is to protect underground sources of drinking water from contamination due to the activities associated with oil and gas recovery operations.

2. The Resource Conservation and Recovery Act -- Under the RCRA administered permitting activities for hazardous waste disposal, one of the primary objectives is to protect the ground water from possible contamination. Special containment structures, including double liners and extensive ground water monitoring provisions of the RCRA regulations are designed to eliminate subsurface contamination. In severe cases such as the Lowry Landfill near the Denver Metropolitan area, RCRA enforcement was utilized to seek to impose fines on its operators because leaks were suspected from this operation. Under the solid waste provisions of the Act, Region VIII assists local governments and Indian Nations in developing better landfill operations that will be properly located and designed to protect the ground waters.

3. The Toxic Substances Control Act -- Under TOSCA the region has been active in containing polychlorinated biphenyl (PCB) spills and improperly located transformers containing PCB. In western Colorado several underground coal mining operations were found to have old transformers containing PCB's. These transformers were below the ground water table and were thought to pose a ground water contamination risk especially if the mines closed as planned. With the company's help, the regional staff aided the removal of these items to permitted hazardous waste sites.

4. The Federal Insecticide, Fungicide and Rodenticide Act -- Under FIFRA the procedures of registering the insecticides and licensing the operators, the potential for ground water problems due to improperly applied pesticides is reduced. The region has investigated approximately 800 allegations of improper pesticide use and only a very few are suspected of possible ground water contamination. Perhaps if these procedures had been in place in the 1950's the high arsenic concentrations in North Dakota, thought to be a result of indiscriminate application of arsenicals for grasshopper control, would not have occurred.

5. Comprehensive Environmental Response and Liability Act -- Under the "Superfund" legislation, the regional office has identified 555 sites, of which approximately 99 percent were thought to pose some risk to the local ground and surface waters. Of the five currently funded sites under investigation for "Superfund" clean up, four of them include known contamination for the subsurface waters.

6. Clean Water Act -- Under the CWA, which does not include ground water activities directly, the region has requested the states to report annually on ground water problems. In addition, the 208 areawide planning efforts contain some funding, on occasion, to study ground water as well as surface water pollution issues. The highlight of this kind of activity is the Jordan River Aquifer study in Salt Lake County, Utah. Under the CWA acts municipal grant program communities are studied for ground water nitrate contamination from septic tanks, a typical problem in the region where thin and tight clay soils occur. Areas around Salt Lake City, Denver's mountain suburbs and the foothills of the Black Hills of South Dakota need centralized sewage facilities because of these septic tank limitations. At 61 municipal and industrial sites in the region, the land disposal of effluent occurs under conditions designed to protect the shallow ground water from nitrate and viral contamination.

7. National Environmental Policy Act -- Under NEPA the region reviews over 120 Environmental Impact Statements annually of which approximately 20 to 30 percent include a significant ground water issue. Chief among these are the Salinity Control Projects where natural or land use aggravated salt build up is to be controlled. In one example, after reviewing the Paradox Valley proposal, the regional staff convinced the Bureau of Reclamation to dispose of the salt brines by deep underground injection rather than surface ponds, which posed a risk to the local aquifer.

B. Implications for Management

1. Ground Water Use and Management in Region VIII

As can be seen by the information presented in the introduction, the regional rural population is approximately 95 percent dependent upon ground water supplies. Presently no community water system in the region enjoys the protection of being designated as a sole-source aquifer. Ground water is managed differently by the region's six states. All states but Utah have a ground water reference in their general statutes; while South Dakota and Wyoming have specific ground water laws. Only Wyoming has specific requirements for ground water quality and an aquifer classification system. Colorado supports the need for both specific standards and for an aquifer use classification system. None of the region's states have authority to limit ground water use based on deteriorating ground water quality although twenty states in the country have some such provision.

2. Monitoring Needs

One of the needs in order to monitor these trends in regional ground water quality is a coordinated monitoring effort both by states and the federal establishment. Currently the region requires all communities to report every third year on inorganic testing of their drinking water. This does not include the expensive tests for organic pollutants such as pesticides or other hazardous substances. This data is widely scattered in the states and the other Federal agencies without a centralized data base such as the STORET data base for surface water. Each state engineer's office and the state health departments maintain some ground water data as does the state agency responsible for oil, gas and mining activities. In the federal establishment, the U.S. Geological Survey, the Bureau of Reclamation, the Corps of Engineers, the Bureau of Land Management, the Forest Service, the Bureau of Indian Affairs, the Department of Defense, the Bureau of Mines, the Fish and Wildlife Service and the Nuclear Regulatory Commission all maintain separate ground water data bases.

There is a need for both a centralized ground water data base in order to assess trends in quality and an expanded list of required monitoring parameters to determine potential health risks.

C. Possible Ground Water Protection Strategies

1. Permitting Actions: RCRA, UIC and 404 Permits

All RCRA permitting actions follow rigorous requirements for the protection of the local subsurface waters. Key provisions include the double liner requirements and the ground water monitoring provisions for both up and down gradient flow. Consideration should be given to the installation of monitoring devices directly under the surface disposal sites to provide early leak detection. In addition, the identification and notification of all domestic and community wells within that area should be provided in the permit notice.

Under the UIC program, the regulations require stringent protection of underground sources of drinking water. (USDW's include all aquifers of less than 10,000 ppm TDS.) Since this program has only recently been delegated to several states, it is too early to give an indication of its ability to protect ground water. In Region VIII over 95 percent of the injection activity involves brine disposal or water injection for secondary recovery of oil and gas.

EPA's program to regulate Class II wells has been delegated to Utah and Wyoming. North Dakota, South Dakota and Colorado are working toward assuming the program. Region VIII is presently working on an implementation program for Montana. The UIC program for all other classes of wells has been delegated to Utah and is expected to be delegated to North Dakota, Wyoming and South Dakota shortly. The region expects to implement its program for Classes I, III, IV, and V for Montana and Colorado. EPA's UIC program requires the regulation of injection on all federal and Indian lands. This has created a permitting overlap with the Minerals Division of BLM. EPA is working with BLM to develop a policy to improve coordination on these permitting actions. It will be important that regulatory means be developed for some of the region's Indian Nations so that no "regulatory holes" exist where unregulated injection activity could occur. Region VIII Indian Nations with significant injection activity include the Fort Berthold, Fort Peck, Blackfeet, Crow, Wind River, Uintah-Ouray, Southern Ute and Navajo Reservations.

The 404 permit program for dredge and fill activity occasionally is involved with recharge zones and sensitive alluvial aquifers. Coordination with the region's ground water staff will be required to identify these few situations.

2. Grant Actions: Superfund Cleanup, Municipal Grants for Waste Water Treatment, Areawide Water Quality Plans and the Nationwide Urban Runoff Program

These EPA program grants include ground water monitoring and protection in a variety of ways. Four of the region's five funded Superfund Cleanup Sites were selected primarily for the ground water contamination problems they are creating. Assurance is made that during the environmental assessment of these sites that all domestic and community wells in the immediate area are identified and if necessary protected. Coordination with the state public water supply system program to provide indication of aquifer cleanup in these areas should be encouraged.

The remaining grant efforts in the municipal waste water treatment presently encourage the land application of municipal effluent and the states should provide additional coordination with their ground water staffs when these plans are considered.

Areawide water quality plans generally ignored the contribution that contaminated alluvial waters affected their adjacent streams. In the Salt Lake County 208 plan this aspect of surface water problems was identified and a unique study is underway to identify the effects of hazardous wastes, solid wastes, mining leachates, septic tanks, irrigation, leaking subsurface tanks and urban runoff have on the local surface and subsurface water quality. More could have been done under the 208 program to identify these interconnections. There are no longer any 208 program funds available to the states for such areawide functions.

The nationwide urban runoff program is limited in scope and should include efforts to identify the role dry wells or drainage control wells play in ground water contamination in the region's cities. (Primacy states are to provide a state-wide assessment of these wells and other Class V wells but the NURP Program could identify their significance in a local area.)

3. Mine Waste Policy: Coal, Uranium, Metal Mining and Oil Shale Mining

The regional office is attempting to take an active role in addressing through its recently formed Mining Waste Team to provide technical assistance and a consistent regional approach to mining waste problems. Under Subtitle C of RCRA the Agency is to report to Congress this spring on this aspect of hazardous waste. As identified in the Attachment B, at least 39 mining sites in the region are known to include significant ground water pollution. Additional coordination is necessary between the Radiation Section and the NRC. An oversight role is needed to cover the Office of Surface Mining provisions, although generally acid mine drainage as a result of coal mining is not a problem in the region's alkaline soils. Copper and molybdenum mining have contaminated water supplies in Salt Lake County, the Animas River, the upper Arkansas River, the Ten Mile Creek drainage of the Blue River, the Leadville-California Gulch drainage and the Homestake drainage in the Black

Hills of South Dakota. The significance of these pollution sources is now being studied by the respective States with little or no coordinating or assistance provided by EPA. Depending upon economic conditions, oil shale mining may yet develop on a large scale in Colorado and Utah. The potential for contamination due to unusual hydrocarbons such as polynuclear aromatic hydrocarbons is there, and little is known about the monitoring, movement, or health risk pathways of this type of pollutant. The recent loss of key staff without replacement in the EIS review function will reduce the Region's ability to provide early identification of potential mine-related groundwater issues. Continued research by the Agency's Cincinnati Lab is essential and the recent policy of not providing semi-annual reports of these research contracts should be reversed to assure coordination between lab and regional activities.

4. Survey of Pits, Ponds and Lagoons

There has been a draft national report on industrial pits, ponds and lagoons. The report indicates that generally the states lack sufficient regulations or guidance to control leaking surface impoundments. The report recommends a technical assistance role and provides funds to assist the states in implementation of an inspection program.

5. Land Use Planning: Domestic Wastes, Non-Point Sources, Avoiding Development on Recharge Zones

The role the states and counties play in identifying these areas for protecting ground water varies. None of the region's states have specific regulatory authority to assure that these factors are considered when land use planning and development occur. Some of the region's counties have passed land use measures that include these concerns for changes in land use. This is a local and state program and the region's efforts include technical assistance and minor work efforts in the NURP, 404, EIS review and RCRA programs.

6. Spill Prevention and Clean Up

On some occasions spills of hazardous materials or gasoline spills have contaminated local shallow aquifers. Since the emphasis in this program is to clean up the spill regardless of whether land, surface or subsurface waters are threatened, no special emphasis is necessary for ground water clean up. However, followup after the event could be considered in some cases where it is not currently to assure that hidden subsurface contamination has not occurred. Consideration should be given to adding the independent Indian Nations to the list of notified agencies in the event of spills on the reservation to assure coordination at that level.

7. Assistance to State Oil Inspectors

When there is an underground storage tank leak of petroleum products, the states often lack certain technical ability to identify the cause and effect of these events. Assistance could be provided at the national level to define the "signature" of these liquids in order to identify the manufacturer and at the regional level for assistance in locating the rate and direction of the plume migration. The Region's assistance on the Northglenn gasoline tank leak is an example of this type of assistance.

8. Quality Changes as a Result of Ground Water Exploitation

As ground water is depleted the lower portions of that same aquifer can contain increased concentrations of inorganic contaminants. The states in Region VIII usually allow ground water development as an associated property right not subject to state control. In some cases such as Colorado's South Platte River Basin, there are limitations on the rate of withdrawal from shallow alluvial aquifers since such sources are subject to the prior appropriation system of senior uses. These limits on withdrawal can influence quality though they are not intended for that purpose. In Wyoming, the state's aquifer classification system (six classes with drinking as the highest and an unusable class as the least protected) can be considered for quality protection purposes through their coordination of efforts between the Department of Environmental Quality and the State Engineer's Office. The agency should assure that any EPA funded research on these areas, such as that done in the Ada, Oklahoma Lab, is provided to the states for their consideration.

9. Quality Changes as a Result of Oil, Gas and Mining Exploration

For the States of Colorado, Montana, North Dakota, South Dakota, and Wyoming these activities represent some of the most serious threats to ground water quality. In South Dakota, where large areas of the state are underlain by artesian aquifers, unplugged exploration wells allow migration of poor quality waters upwards into better quality aquifers. In Wyoming, such unplugged wells in the Big Sandy area have allowed salty brine to be released to the surface and thereby contribute to salt increases in surface as well as subsurface systems. Under EPA's role on the Colorado Salinity Control Forum, states should be encouraged to require proper plugging of abandoned exploration wells. As EPA is currently implementing the SDWA for South Dakota, this issue should be addressed under that program.

10. Additional Monitoring and Coordination of Federal Agency Programs

One of the important Regional and National needs in order to monitor trends in regional ground water quality is a coordinated monitoring effort both by the states and the federal establishment that would be readily avialable to concerned parties. Currently, the Region requires all communities to report every third year on inorganic testing of their drinking water. This does not include expensive tests for organic pollutants such as pesticides or other hazardous substances. This data is widely scattered in the states and other federal agencies without a centralized data base such as the STORET data base for surface water. Each state engineer's office and the state health departments maintain some ground water data as does the state agency responsible for oil, gas and mining activities. In the federal establishment, the U.S. Geological Survey, the Bureau of Reclamation, the Corps of Engineers, the Bureau of Land Management, the Forest Service, Bureau of Indian Affairs, Department of Defense, Bureau of Mines, Fish and Wildlife Service and NRC all maintain separate ground water data bases.

Attachment A

PRIORITY RANKING OF THE REGION'S GROUND WATER THREATS

In considering the approximate ranking on the public health and adverse economic and social costs of threats to ground water in the region, critical data and analysis of information is lacking. While some 115 sites and broad areas of aquifers in the region are identified as having some changes in ground water quality, little data is available to translate these changes into environmental risks. Under the Water Quality Criteria Documents and the Interim Primary Drinking Water Regulations, health risks have been identified for many but not all of the ground water contaminants identified in the region's subsurface waters. However the extent that these contaminated aquifers serve the population in the region has not been identified in any program with the possible exception of the Rocky Mountain Arsenal. The migration of pesticide waste from the Arsenal to the well location in the Brighton area has a thirty year history of relatively vigorous study and thus differs from the recent attempts at identifying these risks.

Few instances of waterborne disease or chemical poisoning due to contaminated ground water have been reported in the region. This is due to the fact that any reduced health effects as a result of low level exposure to organic and inorganic constituents are not reported, (and such exposure takes several decades to develop in the exposed population), some of the population at risk, (such as nitrate exposure by pregnant women) are avoided by using bottled water, and the hazardous waste contamination usually does not occur in areas of ground water use and are thus avoided. The latter is due either to isolation of such disposal sites from the population, the generally deep aquifers in the region not readily susceptible to contamination or the location of these facilities, although they may release contaminated leachates, on shallow alluvial aquifers which flow directly to streams.

Despite this lack of data, the approximate priority of concern for health risks and the other environmental and social costs of ground water threats in the region can be defined into a priority ranking of concern. The following listing should be used for discussion purposes only.

Table 1

Ranking of Activities in Approximate Order of Importance
To Limiting Ground Water Uses in Region VIII

1. Hazardous Waste Disposal Sites
2. Unplugged, Abandoned and Improperly Completed Exploration Wells
3. Industrial Pits, Ponds and Lagoons
4. Mining Wastes (Tailings Piles)
    A. Uranium Tailings and Leaching Operations
    B. Mining Wastes
        1) Copper Leaching and Waste Disposal
        2) Oil Shale Mining (potential)
        3) Gold, Silver and other Metal Mining
        4) Molybdenum Mining
        5) Coal Mining
5. Sanitary Landfills
6. Injection of Liquid Wastes
    A. Injection on Hazardous Wastes (no activity at present)
    B. Injection of Mining Wastes and Mining Recovery
    C. Injection of Brine and Waste Water in Oil and Gas Operations
7. Agricultural Practice
    A. Improper Pesticide Application
    B. Irrigation and Fertilization (nitrate increases)
    C. Irrigation Return Flow (salinity increases)
8. Natural and Land Use Aggravated Problems
    A. Uranium Increases Due to Agriculture Soil Disturbance
    B. Naturally high concentrations of arsenic, fluoride, selenium, uranium and salt which increase due to ground water depletion
    C. Development on Recharge Zones and Sensitive Areas
    D. Dry Wells and Drainage Control Wells
9. Subsurface Disposal of Domestic Wastes
10. Leaking Subsurface Tanks
    A. Chemical Storage Tanks
    B. Gasoline and Petroleum Product Storage Tanks
11. Accidental Industrial Spills

Ground Water Quality Problems

Key

○ Hazardous Waste Sites

△ Injection of Liquid Wastes - Oil and Gas

▲ Injection of Liquid Wastes - Exploration

● Agricultural Practices Including Pesticide Application

◇ Industrial and Municipal Pits, Ponds and Lagoons

◆ Mine Wastes

✱ Subsurface Disposal of Domestic Wastes

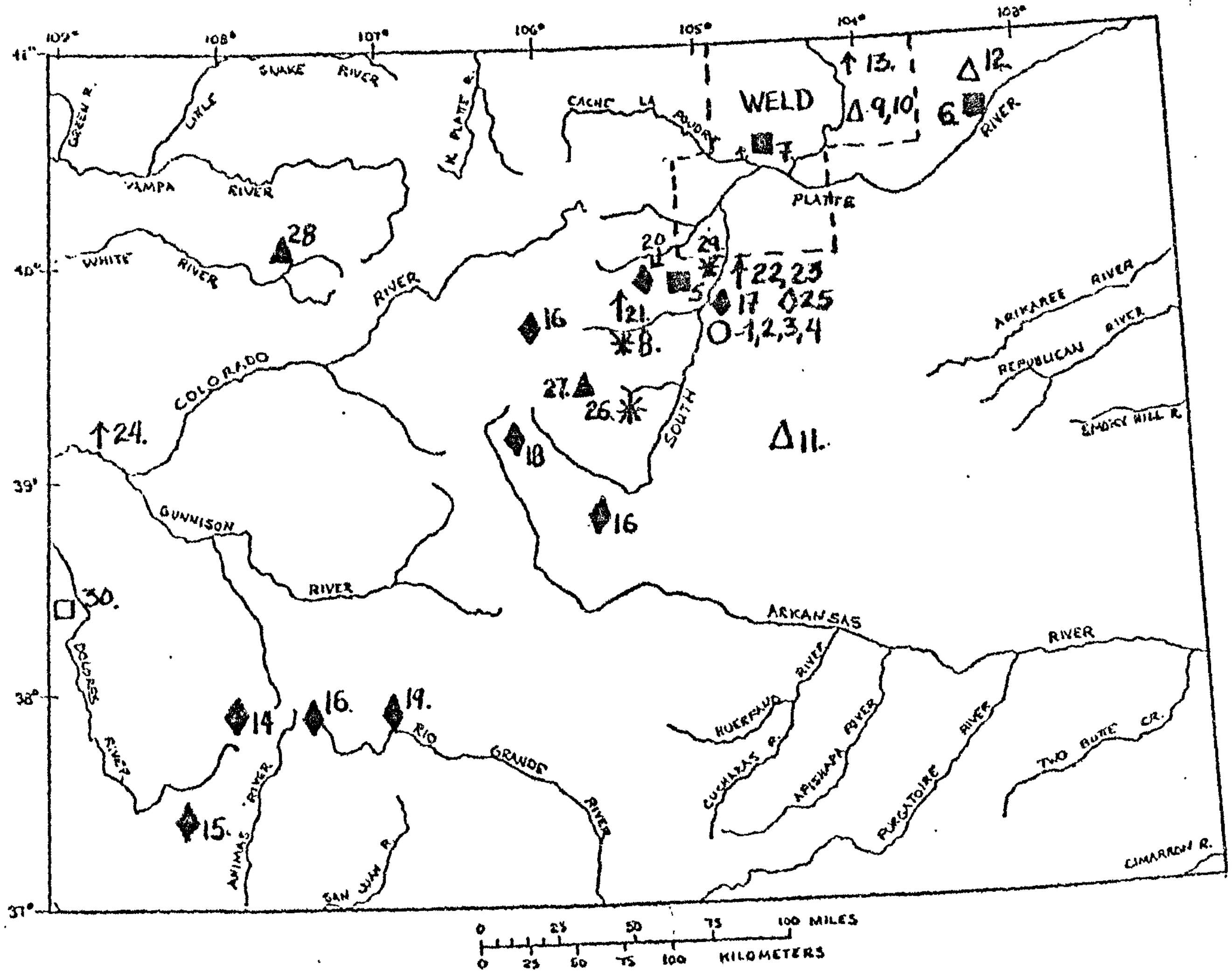
□ Natural and Land Use Aggravated Problems

□ Sanitary Landfills

↑ Leaking Subsurface Tanks

↓ Accidental Industrial Spills

Nitrates



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CACHE LA POUDRE
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WHITE RIVER
COLORADO RIVER
GUNNISON RIVER
DOLORES RIVER
ANIMAS RIVER
SAN JUAN R.
RIO GRANDE RIVER
SOUTH PLATTE RIVER
ARKANSAS RIVER
HUERFANO RIVER
CUCHARAS R.
APISHAPA RIVER
PURGATOIRE RIVER
TWO BUTTE CR.
CIMARRON R.
ARIKAREE RIVER
REPUBLICAN RIVER
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COLORADO

Colorado

Hazardous Waste Disposal

1. Rocky Mountain Arsenal
2. Old Lowry Landfill
3. L-C Corporation
4. Woodbury Chemical Company

Sanitary Landfills

5. Marshall Landfill
6. Sterling Landfill
7. Weld County Landfill
8. Clear Creek Gravel Pits

Oil Field Related Problems

9. Weld County Section 31 Water Disposal
10. Commoache Creek Oil Field
11. Elm Grove Field
12. Weld County Leaking Gas Wells

Mining Wastes

13. Idorado Mining Company
14. Union Carbide Uranium Mill
15. Uranium Mining at Canon City
16. Cadmium Smelting
17. New Jersey Zinc
18. Leadville Mining District
19. Homestake Mine
20. Louisville Coal Fields

Industrial Wastes

21. IBM Plant, Niwot
22. Gas Station in Northglenn
23. Continental Oil and Asamera
24. Asamera Oil
25. Gary Western Refinery

Agricultural Wastes

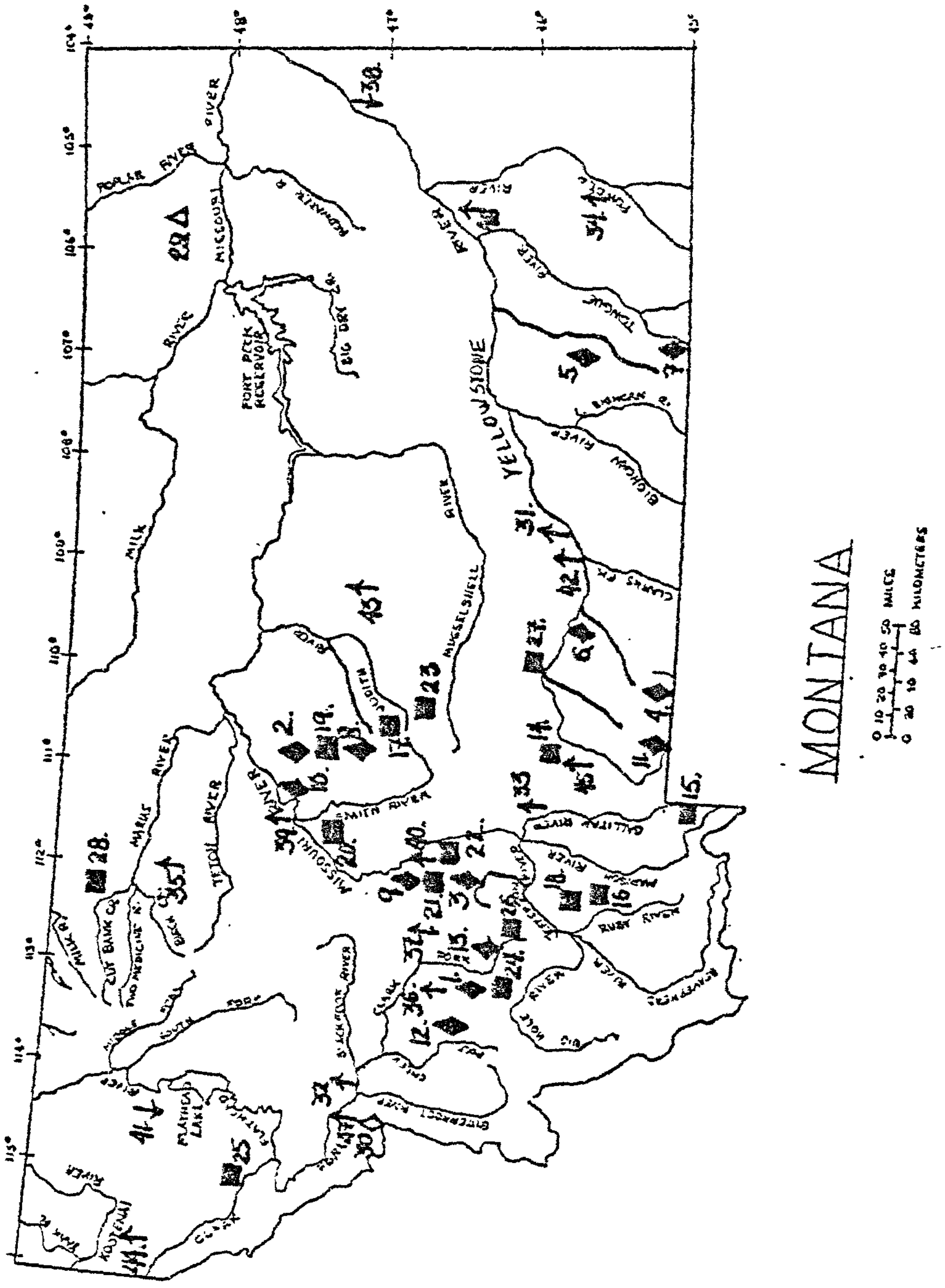
26. Monier's Mile Hi Feedlot
27. Alluvium of South Platte (nitrates)

Land Use Related Problems

28. Alluvium of South Park (uranium)
29. Septic System Percolation
30. French Drains

Natural Sources

31. Paradox Valley Salinity
32. Meeker Dome


MONTANA
YELLOWSTONE
MISSOURI
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MUSSELSHELL
FORT PECK RESERVOIR
BIG DRY
POPLAR RIVER
TONGUE
BIGHORN RIVER
JUDITH
SMITH RIVER
TETON RIVER
MARIAS RIVER
FLATHEAD LAKE
KOOTENAI
CLARK FORK
BITTERROOT RIVER
BLACKFOOT RIVER
GALLATIN RIVER
MADISON RIVER
RUBY RIVER
BIG HOLE RIVER
JEFFERSON RIVER

Montana

Mining - Abandoned and Active

1. Anaconda
2. Belt-Stockett-Sand Coulee
3. Basin Mining Area
4. Cooke City
5. Colstrip
6. Columbus
7. Decker
8. Hughesville
9. Helena Mining Area
10. Great Falls
11. Jardine
12. Philipsburg
13. Silver Bow Creek

Solid Waste Disposal Landfills

14. Old Livingston Landfill
15. West Yellowstone Landfill
16. Alder Dumpsite
17. Stanford Dumpsite
18. Sheridan Dumpsite
19. Sand Coulee Dumpsite
20. Cascade Landfill
21. Helena Landfill
22. Scratchgravel Landfill
23. Judith Gap Dumpsite
24. Anaconda Landfill
25. Plains Landfill
26. Butte Landfill
27. Big Timber Landfill
28. Cut Bank Landfill

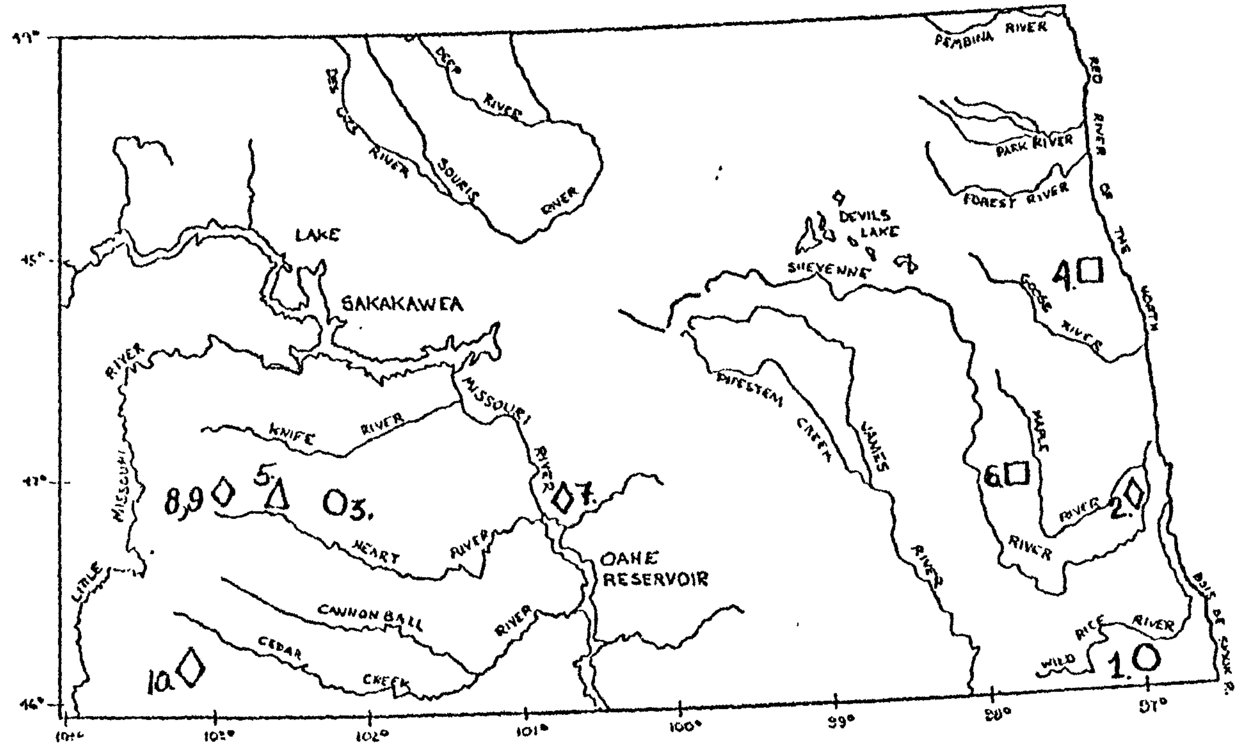
Oil and Gas Exploration & Development Activity

29. Fort Peck Indian Reservation
30. Champion Pulp Mill

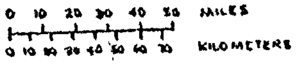
Accidental Spills & Leakage

31. Billings
32. Bonner
33. Bozeman
34. Broadus
35. Conrad
36. Deerlodge
37. East Helena
38. Glendive
39. Great Falls

40. Helena
41. Kalispell
42. Laurel
43. Lewistown
44. Libby
45. Livingston
46. Miles City
47. Missoula

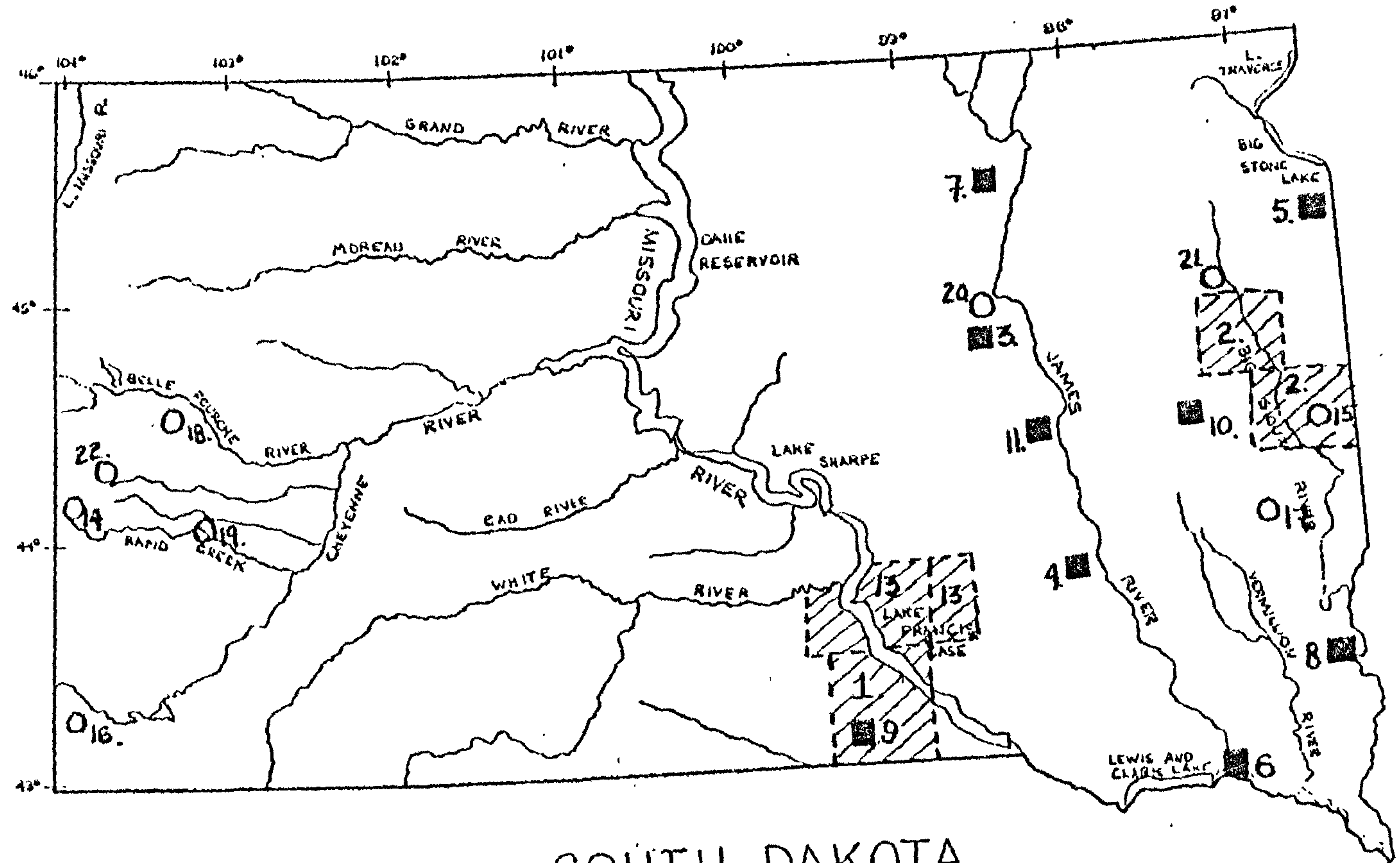


NORTH DAKOTA



North Dakota

1. Southeastern North Dakota Arsenic Issue
2. Husky Industries, Inc.
3. Landfill near Grand Forks
4. Sodium Chromate, Western North Dakota
5. Valley City Landfill
6. Amoco Refinery Sludge Dump, Mandan
7. North Ashing Site, Six miles northwest of Belfield
8. South Ashing Site, Southeast end of Belfield
9. Bowman Lignite Ashing Site



SOUTH DAKOTA

Non-Point Source Pollution

1. Municipal wells in Gregory County
2. Big Sioux Basin (Hamlin and Brookings Counties)

Landfills

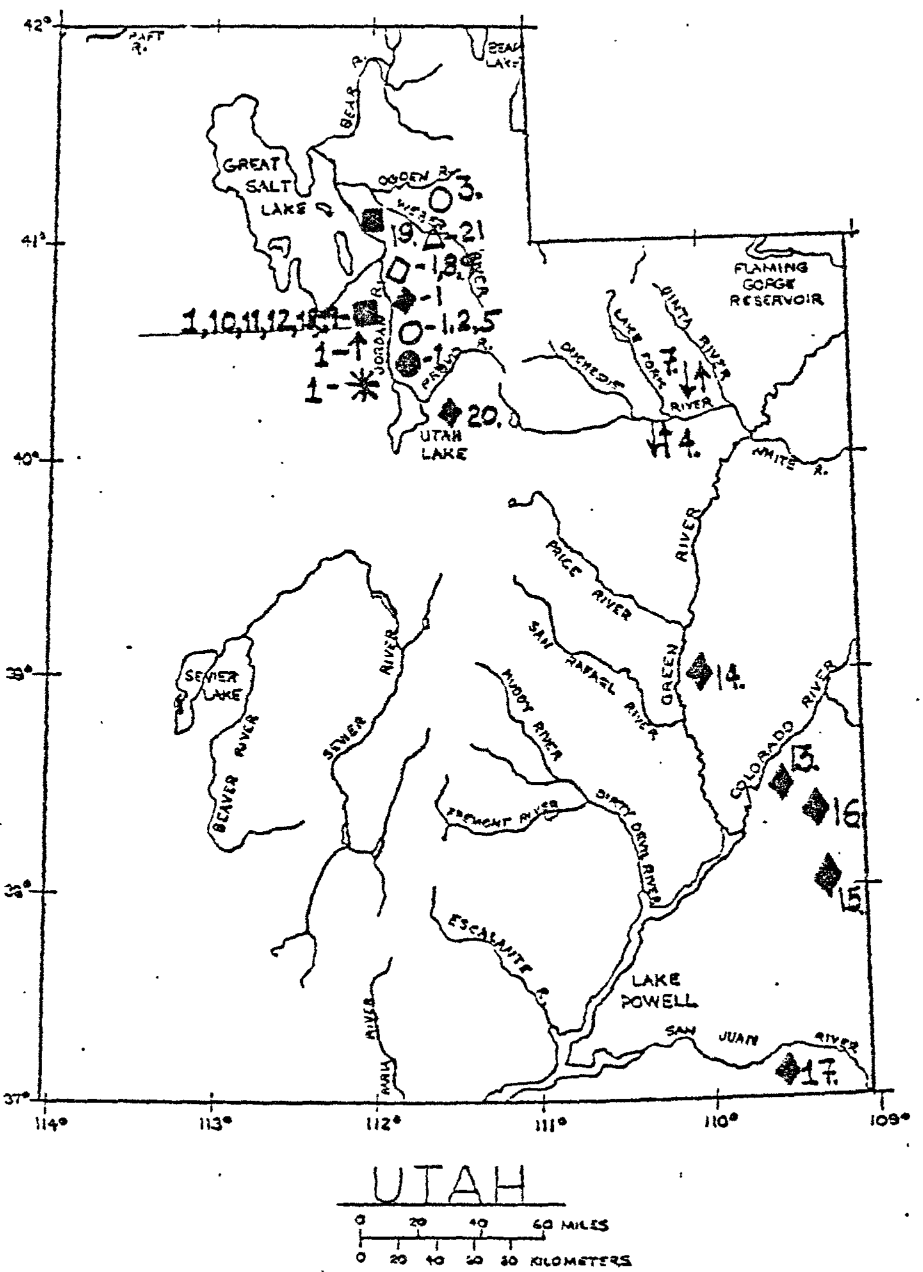
3. Brookings
4. Redfield
5. Mitchell
6. Vermillion
7. Aberdeen
8. Canton
9. Gregory
10. Milbank
11. DeSmet
12. Huron

Private Wells

13. Aurora and Brule Counties

Hazardous Waste Sites

14. Black Hills Ordinance Depot
15. Brookings Landfill
16. Edgemont
17. Highland Electric Company, Madison
18. Landfill near St. Onge, Lawrence County
19. Rapid City Landfill
20. Redfield Iron and Metal
21. Watertown City Landfill
22. Whitewood Creek, near Lead



GREAT SALT LAKE
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BEAR LAKE
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PROVO R.
UTAH LAKE
FLAMING GORGE RESERVOIR
UINTA RIVER
LAKE FORK RIVER
DUCHESNE
WHITE R.
PRICE RIVER
GREEN RIVER
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MUDDY RIVER
COLORADO RIVER
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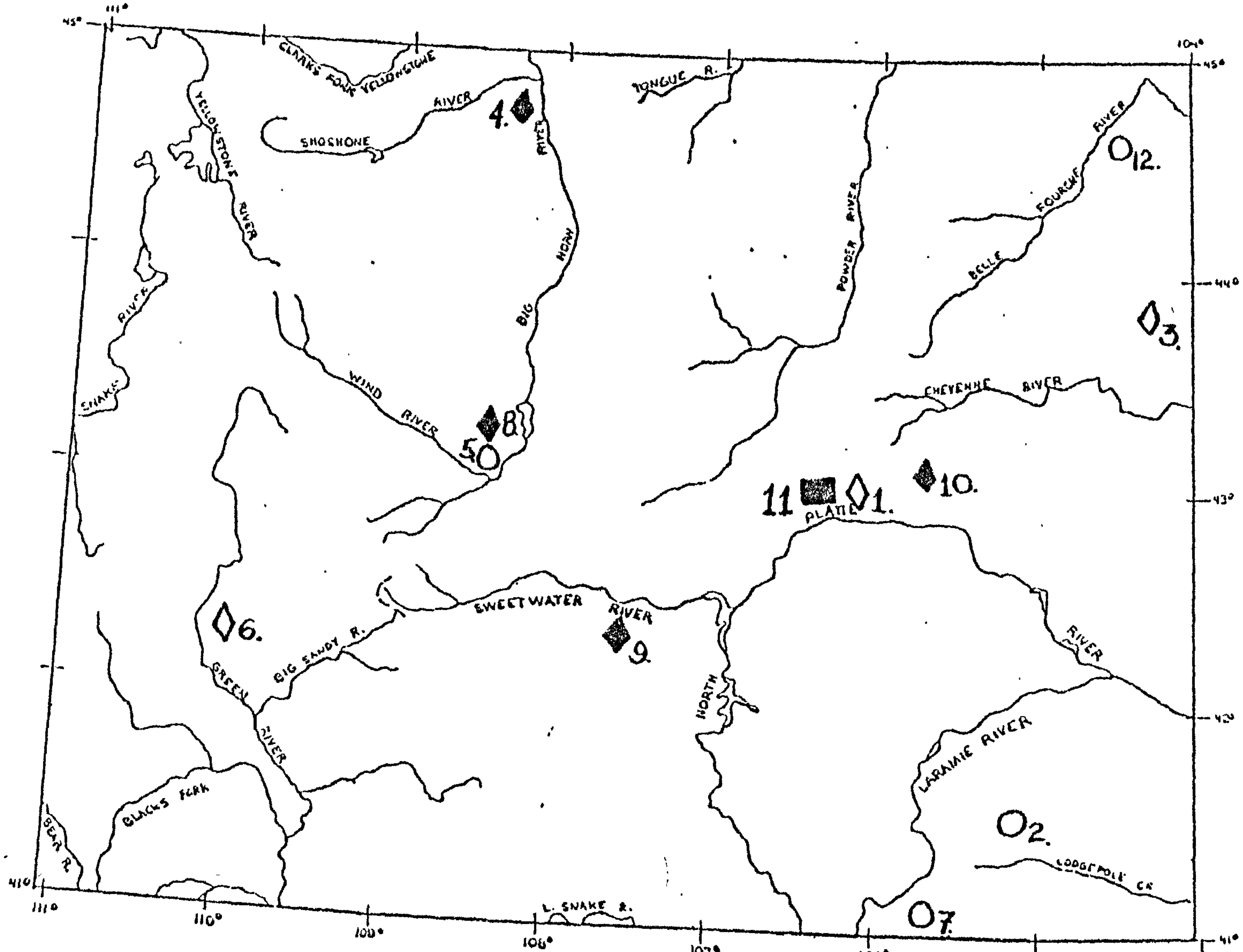
Utah

1. Salt Lake County
2. 500 West North Temple, Salt Lake City
3. Defense Depot, Ogden
4. Duchesne
5. Fenced Barrel Site, Southeast of main railroad yard of Union Pacific, SLC
6. Old Cobalt Tailings Pond, Magna
7. Roosevelt, east of Neola Highway, 1 mile north of Roosevelt
8. Rose Park Canals, Salt Lake City
9. Rose Park Oil Sludge Dump, Salt Lake City
10. Valley Landfill, Salt Lake City
11. County Landfill, Salt Lake City
12. West Valley Landfill, West Valley
13. Atlas Mineral Corporation Mill Site, Moab
14. Green River Uranium Mill Tailings
15. Inactive Mill Site and Town, Monticello
16. Uranium Mill Tailings, Thompson
17. Vitro Uranium Mill Tailings near Mexican Hat
18. Bay Area Refuse Disposal, West Bountiful
19. North Davis County Landfill, Layton City
20. Trojan Division (Gomex), Spanish Forks
21. Woods Cross Refinery, West Bountiful


CLARKS FORK YELLOWSTONE
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SHOSHONE
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BIG SANDY R.
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NORTH
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LODGEPOLE CR.
BLACKS FORK
BEAR R.
L. SNAKE R.
O7.

WYOMING

Wyoming

Hazardous Waste Sites

1. Amoco Refinery Dump, Casper
2. Horse Creek near Laramie
3. Old Refinery, Newcastle
4. Porcupine Creek Mine, Big Horn Mountains near Lovell
5. Riverton Sulfuric Acid Plant, Southwest of Riverton
6. Southwestern Refinery Company, LaBarge
7. Union Pacific Railroad, Laramie (Creosote Plant)
8. Riverton Uranium Mill Tailings
9. Split Rock Uranium Mill Town, Jeffrey City
10. Spook Site, Converse County
11. Casper City Dump
12. Leefe Plant

ATTACHMENT B - DETAILS OF THE MOST SIGNIFICANT

GROUND WATER QUALITY THREATS

COLORADO

Conclusion: Present occurrences of ground water contamination are geographically widespread in Colorado. In some cases the contamination has already impacted existing or projected beneficial uses of ground water, including public drinking supplies and agriculture. As Colorado's population expands and new sources of water are required to meet demands, ground water contamination problems and conflicts with beneficial uses can be expected to increase.

A. Hazardous Waste Disposal:

1. ROCKY MOUNTAIN ARSENAL: Disposal of chemical warfare agents and insecticides in unlined and lined ponds and by spills of chemicals and pesticides in various storage areas at the Shell chemical plant has caused local ground water contamination. Problem was first noticed in the 1950's when chloride salts began moving off-site to the north. Organic contaminants including many carcinogens have moved off the site.

Disposal Methods
a. Basins A, B, C and D were unlined. Basin A received all wastes from 1947-53, Basin B, C and D were used until 1957.
b. Basin F has an asphalt liner (of questionable integrity) which was constructed in 1957.
c. Disposal by injection wells from March 1962 to February 1966.

Present Status
a. The RMA has instituted a contaminant program and has constructed a mile long slurry barrier across the northern boundary. This boundary goes through the alluvium into the bedrock to keep contaminants in the alluvial aquifer from moving off-site. Contaminated water is pumped to the surface and treated with activated carbon and reinjected down gradient from the barrier.
b. A barrier system comprised of two lines of pumping wells and two lines of clean water injection wells has been constructed on the northwest boundary to intercept and treat a contaminant plume moving off site from Shell's rail yard.
c. A similar barrier system is planned for a second plume slightly north of the rail yard plume. This will intercept a plume moving out of Basin F.
d. Closure and removal of the remaining waste in Basin F is under way.
e. The 12,000 foot deep disposal well is unplugged and closure plans have not been developed.
f. A Memorandum of Agreement between EPA, Colorado Department of Health, Shell Chemical Company and the Army has been developed concerning cleanup and contaminant containment on the arsenal.

Present Ground Water Use
In 1980, DBCP (dibromochloropropane), a pesticide manufactured at the Arsenal was detected in the Town of Irondale's drinking water supply. Because

of DBCP concentrations, a municipal well for Irondale is still not being used. The DBCP has also been detected in private water wells in the Irondale area. Crops in the area that have been irrigated with contaminated well water have also been damaged.

Wells immediately north of RMA are primarily for stock watering. Domestic supplies are obtained from wells farther to the north near Brighton.

Domestic supplies are being obtained via private wells in the Ironton area along the northwest boundary.

A public water supply well which contains TCE is being used by South Adams Water Company. The well lies on the northwest boundary on the south edge of the South Adams Water and Sanitation District and Irondale.

References
-- Colorado Surface Impoundment Assessment
-- Memorandum of Agreement between RMA, EPA, Colorado Department of Health and Shell Chemical

2. OLD LOWRY LANDFILL: Operated by the City and County of Denver near several southeastern suburbs of Denver. The site was originally intended to be a sanitary landfill but began receiving industrial wastes, including organic solvents soon after opening. The site was closed in 1980 when Waste Management, Inc. began operating a new hazardous waste site to the north.

Disposal Methods

a. Most liquid wastes were disposed of in pits excavated in bedrock which is interbedded with claystones and sandstones.
b. Some of the liquid waste was disposed in pits excavated in previously filled garbage. This was especially true of waste oil.
c. Low level radioactive hospital waste was disposed in trenches excavated in the claystone.
d. A large part of the now closed area was used to land farm sludge from the Denver Metro treatment plant. Because of high waste loads, the nitrogen levels were in excess of the soil's ability to handle.

Present Status

The City and County of Denver are developing a plan to deal with the contamination in Section 6. The ground water on the site has been found to be contaminated and is moving to the north in the alluvial aquifer. No off-site contamination has been detected to the west in any of the four monitoring wells which are just off-site. The State is not satisfied with Denver's progress to date to develop a plan to deal with contamination in Section 6.

The City is developing a plan to build a containment system on the north side of the site to keep contamination from moving off-site. Water trapped by the system will be pumped to a lined evaporation pond on site.

Ground Water Use

There are no domestic water wells near the site. It is possible that shallow aquifers could carry pollutants off-site to nearby residential areas. The Cherry Hills Water District operates a community well system two miles to the north.

References
-- Ground Water Quality Near A Sewage Sludge Site And A Landfill Near Denver, Colorado. May, 1977. USGS Open File Report.
-- Proposal: Hydrogeologic and Geotechnical Study Waste Containment Structures, Denver-Arapahoe Disposal Site by Golder Associates.

3. L-C CORPORATION: Disposal site for acid waste by-products near Sand Creek between Dahlia Street and Vasquez Boulevard in Denver. Site was active from 1968 to 1970. Waste was found to contain chromium, p-chlorophenyemethysulfide, etc. The shallow ground water was contaminated and is discharging into Sand Creek.

Disposal Methods
Used 3 to 4 pits lined with plastic.

Present Status
State has required implementation of a neutralization program and a monitoring program. Both are on-going. The principal means of cleaning was installing trenches filled with limestone down gradient from the pits.

Water Use
Unknown.

4. WOODBURY CHEMICAL COMPANY: Located at 5400 Jackson Street in Commerce City, this is a former pesticides plant which burned in 1965 leaving high pesticide residuals in the soil. Ground water on site is contaminated.

Present Status
Studies are underway to determine the extent of problem and the remedial actions needed.

Ground Water Use
Unknown.

5. BRODERICK WOOD TREATING COMPANY: Located at Huron and 58th Street in North Denver (Section 9, T3S, Range R68W).

Company pressure-treated wood ties and used three on-site pits to dispose of wastes. No information is presently available about the volumes or types of wastes although it is suspected that pentachlorophenol may have been disposed.

Seepage from this site is apparently beginning to show up on the edge of the nearby Tejon Landfill. The State is investigating the need for clean-up at this site and is considering enforcment action.

B. Sanitary Landfills

1. MARSHALL LANDFILL: Located adjacent to South 66th Street, one mile south of Colorado Hwy. 170 next to community ditch from Marshall Lake. This ditch provides raw water to Louisville. The landfill lies on the north end of the active Marshall landfill operated by Browning Ferris Industries.

Disposal Methods

Landfill received sanitary wastes which were placed in area which was mined for gravel. Former operator claims that fill was buried above the ground water. Fill was covered after burial.

Present Status

This is a funded Superfund site. Monitoring wells have been drilled around the site to determine the extent of ground water contamination. Contaminated leachate is flowing from the toe of the slope into the ditch. Under the consent agreement reached by EPA, the State and the County, a contract has been let to the CDH to do complete site studies and develop a remedial plan. Browning Ferris Industries is taking the lead in developing remedial action.

Ground Water Use

Contamination from the inactive portion of Marshall Landfill is known to be affecting ground water adjacent to a ditch carrying the City of Louisville's water supply. This contamination, which consists of both organics and inorganics, may already be impacting Louisville's water supply, though there is available a large dilutional capacity to minimize such effects.

2. STERLING LANDFILL: Located near Sterling, this landfill received oil and meat packing house wastes and is believed to have potential for ground water contamination.

3. WELD COUNTY LANDFILL: Located near Greeley, this landfill receives domestic solid waste and some photochemical wastes from Kodak Company. There is concern about ground water problems.

4. CLEAR CREEK GRAVEL PITS: There are numerous old gravel pits along Clear Creek which were filled in with solid waste and fly ash from the Cherokee Power Plant. Some have clay liners, but the waste is in ground water. No firm data is available on the number of such sites.

Present Status

There have been proposals to conduct a study including ground water monitoring. State geologist's office feels that such sites are related to the water quality problems in the alluvium.

Ground Water

Alluvium is used for irrigation and for domestic purposes.

C. Oil Field Disposal Problems

1. Weld County Disposal -- Located East of Fort Lupton,this pit is used for disposal of brine and waste oil from nearby oil and gas fields. This operation received a cease and desist order from the Colorad Water Quality Control Division in 1979.

Disposal Method

Site originally used 3 ponds which were 12 feet deep and overlie a outcrop of the Laramie formation. The pits were reported to have liners of 3 inch bentonite. A significant amount of seepage was occurring as the inflow was exceeding estimated evaporation by 4,000 cubic feet per day.

Present Status

The first pond which is used for ore separation has been concrete lined and the second pond has had a thicker clay liner installed. The site is being investigated by CDH and Weld County.

Ground Water Use

These ponds overlie a major drinking water aquifer in the area which is also used as an irrigation supply.

References

Colorado Surface Impoundment Assessment

2. Weld County Section 31 Water Disposal -- This is an oil field brine disposal site located in Weld County. The facility applied for a permit in 1977 but concern was raised because brine which was slated to be disposed of had a TDS ranging from 8,000 to 20,000 mg/liter. The operator began operating without a permit in 1978.

Disposal Method

Brine was dumped into a pit where it could be pumped to oil separator tanks. Clean brine was then sent to a leach field. Brine was apparently recharging the Laramie Formation. The operation was disposing of a main volume of 40,000 gallons per day. This site is located on a recharge area of the Laramie Formation which is used extensively in the area for domestic and agricultural water supply.

Present Status

Operator was planning expanded operations with clay lined pond. Need follow up data.

Reference

Colorado Surface Impoundment Assessment

3. Commoache Creek Oil Field -- located in Elbert County. The field was discovered in 1970. Ponds are used for disposal of produced water. The Surface Impoundment Assessment study rated this as having a very high ground water pollution potential.

Disposal Method

At the time of the SIA, there were four ponds in use without liners.

Present Status

No RCRA inspections have been made. Probably still in use.

Ground Water Use

No information.

Reference

Colorado Surface Impoundment Assessment

4. Elm Grove Field -- located in Logan County. Field discovered in 1957. Ponds used for produced water disposal. SIA ranked this as having a high ground water pollution potential.

Disposal Methods
Used two ponds without liner.

Present Status
Not inspected.

Ground Water Use
No information.

References
Surface Impoundment Assessment

5. Weld County Leaking Gas Wells -- methane has entered drinking water aquifer in Weld County and affected 3 water wells. The methane is coming from improperly completed gas production wells.

Present Status
No information.

Reference
Memo from Bill Dunn - CDH

D. Mining Wastes

1. Idorado Mining Company, Telluride -- Copper and other heavy metal mining has resulted in metal contamination including toxic hexavalent chromium into the local alluvial aquifer. This aquifer supplied part of Telluride's water supply at one time, but had to be abandoned.

Disposal Method
Surface disposal of tailings without liner.

Present Status
Active Mining.

Ground Water Use
Alluvial source intended to supply Telluride's new development.

2. Union Carbide Uranium Mill -- The Club Ranch tailing ponds have been shown to contaminate subsurface waters. High levels of ammonia, sulfate, sodium and other inorganics may be seeping into the ground water alluvial area of the San Miguel River. The contaminated ground water ultimately discharges into the river thereby aggravating an existing salinity problem.

Disposal Method
Surface disposal of aqueous mill tailings.

Ground Water Use
No information.

Reference
A Review of Ground Water Problems in Colorado, Colorado Department of Health, 1982.

3. Cotter Uranium Mill -- The mill is located near Canon City and has processed uranium ore since the 1950's. Disposal from the original mill was into unlined ponds. Radioactive wastes are known to have entered the underlying abandoned coal mine and a local reservoir. A plume of contaminants has also moved off-site to the north resulting in high molybdenum levels in wells in the Lincoln Park area. Studies to define the nature of the problem are ongoing.

4. ASARCO Cadmium Processing -- Water and soil samples taken from a drainage ditch near the ASARCO cadmium processing tailings pile in north Denver, contain high levels of cadmium, arsenic and lead. Of immediate concern are the implications of soil and surface water contamination in the ditch, which is an open and unrestricted area next to a low income housing project where several hundred people live. Recent investigations indicate that ground water impacts are unknown. The Colorado Department of Health is proceeding with an agreement with ASARCO to minimize the problems at this site.

5. Leadville Mining District -- This is a large mining district on the edge of the Arkansas Valley. The presence of ground water moving through the mineralized limestones has resulted in a very severe acid mine problem. This problem has been aggravated by two drainage tunnels which drain some of the mines.

a. The Leadville Tunnel is owned by the U.S. Bureau of Reclamation and discharges water containing high levels of zinc, iron, manganese, etc. into the Arkansas River.

b. The Yak Tunnel drains mines owned by Asarco and discharges low pH, high metal content water into California gulch. This problem is aggravated by the presence of a large quantity of old mill tailings on the bottom of the gulch which provides additional metal loading prior to the waters reaching the Arkansas. Ground water from the mineralized limestone also discharges into the gulch.

Under the Superfund program EPA is presently studying the feasibility of removing the tailing from the gulch to reduce some of the source of metals.

6. Homestake Mine -- This mine is located at Creede, Colorado. The disposal of mill wastes into unlined tailings areas has resulted in cyanide contamination of the ground water. The plume is moving slightly but has not moved off-site.

7. Louisville Coal Fields -- This is a large area running north from Superior, Colorado to Louisville, Colorado. The mines are in the Laramie Formation which supplied good quality drinking water throughout the Denver basin. The mines have been abandoned and water allowed to return to the mined out areas. The introduction of large open areas and oxygen to the coal beds has resulted in extremely poor quality water high in sulfates, iron, organics, etc. There is concern that pumping in the adjoining non-mined areas of the Laramie will induce movement of contaminants in the mines into the good quality portion of the aquifer.

8. New Jersey Zinc -- The tailings piles at the New Jersey Zinc Mine south of Minturn, Colorado, have caused seepage into ground water and Cross Creek. Heavy metal contamination has seriously effected the water quality of the stream and is believed to have adversely effected the potential uses of the local aquifer.

E. Chemical Storage Areas

1. IBM Plant -- There has been leakage of various organics from storage tanks at the IBM plant near Newal. The ground water in the Laramie Formation has been contaminated by toluene and other organics. A barrier wall has been installed to allow recovery and treatment of contaminated waters.

F. Feedlots

Ground water contamination from feedlots has been documented in Colorado. Levels of total dissolved solids, ammonia, nitrates and other constituents in aquifers near feedlots often exceed recommended concentrations.

Monier's Mile-Hi Feedlot, located two miles north of Brighton in Weld County, is of particular concern. An unlined surface impoundment is in place to catch drainage from sheep pens. Contamination of water wells in the area is suspected to be present in at least 34 similar sites in Colorado.

G. Refineries, Pipelines, Gasoline Stations and Oil Separation Ponds

Petroleum and petroleum by-products have seeped into subsurface formations because of spills or storage tank and pond leaks. Toxicity is usually not a problem, since the water is already undrinkable due to taste and odor before the concentrations reach toxic levels. Recently in Northglenn a gasoline leak from a service station was responsible for contaminating shallow ground water, which eventually seeped into the basements of homes in the area. Three refineries--Continental Oil and Asamera in Commerce City and Gary Western in Fruita-- are suspected to be responsible for ground water contamination discovered near their facilities.

H. Illegal Dumping

Although the extent of illegal dumping is not known in Colorado, most documented cases involve brine disposal associated with oil and gas production. Dumping of chemical wastes is also suspected of being fairly common. Often these chemicals contain acid and other wastes which can be very toxic to humans. The dumping of agricultural wastes, including animal waste and excess herbicides and pesticides, poses a threat to ground water.

Unpermitted landfills and dumps may also threaten ground water. At unpermitted landfills, attention is seldom paid to the nature of the material diposed and liners and ground water monitoring wells are usually nonexistent.

As with other ground water quality problems, the likelihood of contamination affecting public health depends on the proximity and depth of ground water, the existence of subsurface barriers and the location of irrigation and drinking water wells.

I. Septic System Percolation

Septic tanks sometimes lead to significant ground water contamination problems. Septic tank problems usually occur when they are placed in soils that are inadequate to perform the necessary digestion or when they are located near water wells.

Nitrates in excess of drinking water standards have been found in the mountainous areas of Jefferson and Park counties. It is believed that the contamination is due to a combination of inadequate rocky soils, proximity of septic tank fields to water wells and the low volume of fault zone ground waters. Colorado is currently updating it's individual sewage disposal system regulations.

J. Unplugged Exploration Holes

This is believed to have the potential for being a very severe problem. This activity often results in establishing hydrologic communication between aquifers of widely varying quality. Depending on the relative leads in the aquifers, poor quality water may enter the good quality aquifer.

1. South Park Alluvial Basin -- This basin was the site of extensive drilling for uranium during the late 1970's with thousands of test holes being drilled (some as deep as 3,000 feet). The ground water in this discharges into the South Platte River. There have been no studies to determine if shallow ground waters have been impacted by the drilling.

2. Meeker Dome -- This is located near Meeker and is the site of two improperly plugged oil exploration wells. Brine from a deep aquifer was moving up the open hole and moving around the improperly set plug via fractures in the formation surrounding the plug. This brine ultimately discharged to the White River. The U.S. Bureau of Reclamation has reentered the suspected problem wells and drilled out the old plugs. New cement plugs were placed at the top of the formation which is the brine source. It is believed that this has reduced the flow of brine which was entering the shallow aquifers and the river.

K. French Drains

French drains are used to collect storm runoff from highways, parking lots and fields. The runoff is then disposed in shallow wells, usually less than twenty feet deep. Many contaminants such as phenols can be introduced to ground water through french drains, since rain water can pick up virtually any substance which is found in the air or on the land surface. This type of well is often found at industrial sites.

Contaminants may include salts used for snow removal, oil and gasoline, pathogens, pesticides and herbicides, heavy metals and various organics. The magnitude of ground water problems due to french drains has not been documented. 230

1. I-25 -- Most drainage from the median strip of I-25 north of Denver is disposed of via french drains.

L. Sewage Lagoons

A few small towns in Colorado still use unlined ponds to treat sewage. Unlined lagoons pose a potential threat to ground water, since nitrates and pathogens and other undesirable material may migrate into aquifers. An added problem with sewage lagoons is that unlike most surface impoundments, they are usually near population centers and rivers.

Unlined sewage lagoons are the exception rather than the rule because of new regulations and better technology. A 1981 survey found only three unlined sewage lagoons in Colorado where major ground water contamination potential exists.

M. Natural Contamination

1. Paradox Valley Salinity -- The Paradox Valley overlies a large salt dome in Southwestern Colorado near the town of Bedrock. Recharge to the alluvium overlying the salt circulated through the top of the dome and leaching out the sodium chloride. This resulting ground water has a total dissolved solid of more than 260,000 mg/liter. The ground water ultimately discharges into the Delores River near Bedrock.

The U.S. Bureau of Reclamation is presently installing a well field that will divert the flow of brine from the spring into a deep brine disposal well.

N. Agricultural and Land Use-Related

1. Northeastern Colorado -- Several counties in Northeast Colorado have experienced increases in nitrates in the ground water of the alluvium of the South Platte River. It is suspected that the problem is due to over application of fertilizer. The water districts have asked for State and Federal assistance in developing a regional ground water quality monitoring program and guidelines for fertilizer application.

2. Increasing Uranium in South Platte Alluvial Aquifers -- Many domestic wells produce water which has uranium in excess of the 10 picocuries/liter health risk guideline developed by EPA. It is believed that the amount of uranium is increasing because of the introduction of oxygen rich water to the alluvial aquifers during over irrigation.

Conclusion: Ground water pollution has occurred due to mining. Both abandoned and active mines can discharge highly acidic water causing degradation of ground water. Contamination of surface waters from abandoned mining operations is well known, however, hidden pollution of alluvial aquifers with acids and heavy metals occurs in every instance of acid mine drainage to surface waters. While acid mine drainage is normally associated with metal mines in the mountains, acid mine drainage has also occurred in the Belt-Sand Coulee coal mining area southeast of Great Falls. Strip mining coal also can create serious ground water problems.

A. Mine Related Problems

1. Anaconda: Ground water around the abandoned smelter is believed to be impacted by solid waste dumps. Studies are continuing. Seepage from Warm Springs and Opportunity tailing ponds may be occurring. There is no known use of ground water.

2. Belt-Stockett-Sand Coulee: Acid mine drainage from abandoned coal mines is not believed to be affecting drinking water sources but is adding metal contaminants to the alluvium.

3. Basin Mining Area: Problems are occurring due to seepage from old tailings piles. No ground water is being used, but impacts have been recorded on the following local streams: High Ore Creek, Basin Creek, Uncle Sam Gulch, Cataract Creek.

4. Cooke City: Abandoned mine tailings are contaminating springs with heavy metals. The main impact is on Soda Butte Creek.

5. Colstrip: Active coal mining is occurring in the area. Studies show ground water moving through spoils has elevated total dissolved solids, magnesium, calcium, sulfate, lead and nickel levels. There is a possibility the Fort Union aquifer, primarily used for stock watering might be affected.

6. Columbus: The ground water contains chromium from an old chrome ore processing waste pile.

7. Decker: This is an active coal mining area similar to Colstrip with high TDS and inorganic constituents in the alluvial ground water.

8. Hughesville: Metal contamination occurs in ground water below the old tailings pond. There is no use of ground water in the area.

9. Helena Mining Area: Cyanide was detected in water being pumped to supply the mill at the Franklin Mine. Cyanide in springs below the Goldsil Mine tailings ponds have caused two fish kills in Silver Creek. Acid mine drainage has been recorded from abandoned mines and mine tailings along Spring Creek, Prickly Pear Creek and Ten Mile Creek. Ground water contamination has occurred in the Spring Creek area.

10. Great Falls: Ground water at the abandoned Anaconda copper and zinc refinery is laden with heavy metals. Further studies are being carried out. There is no known use of ground water. 232

11. Jardine: Arsenic has been found in ground water near these mining activities.

12. Philipsburg Mining Area: Mercury and heavy metals have been found in alluvial aquifers in mined areas in the Flint Creek Range.

13. Silver Bow Creek: The alluvial aquifer from the confluence of Copper Creek in Butte to the Warm Springs Ponds northeast of Anaconda has received industrial, municipal, agricultural and doemstic wastes for more than 100 years. Contaminants include heavy metals and elemental phosphorus.

Coal seams like those found in the Fort Union Formation in eastern Montana can be important ground water aquifers. Removal of these coal seams has affected ground water availability in areas down gradient from strip mines. Studies have shown that ground water moving through strip mined spoils developed elevated levels of total dissolved solids (TDS), magnesium, calcium, sulfate and heavy metals.

B. Solid Waste Disposal Landfills

Ground water contamination from solid waste disposal sites occurs as ground water moves laterally through buried wastes or as water percolates down through waste. Prior to 1977, solid waste disposal sites or landfills were licensed by counties, but in 1977 the Montana Solid Waste Management Bureau was given license to establish a statewide landfill review and licensing system. Before 1967 there were no landfill licensing or review requirements. Landfills established prior to 1967, and to a certain extent prior to state licensing in 1977, are more likely to pose a pollution threat to ground water.

Prior to the licensing requirements, many communities did not thoroughly consider environmental consequences when siting waste disposal areas. Landfills have been sited in drainage areas with permeable soils and shallow ground water. Described below are landfill sites which threaten to contaminate ground water. Many of the landfills have been closed or are expected to close. Monitoring programs are done on a case-by-case basis and are extremely limited due to high costs. Other landfills undoubtedly pose a threat to ground water quality; those described below appear to pose the worst pollution hazards:

1. Old Livingston Landfill. This sanitary landfill, located approximately one mile northeast of Livingston adjacent to the Yellowstone River, has been closed. The landfill area is underlain by shallow alluvial ground water. A portion of the landfill actually lies beneath the ground water table. The ground water at the site has elevated TDS, hardness, alkalinity, chloride, potassium, total organic carbon (TOC) and chemical oxygen demand (COD). The ground water in the general area is used for domestic, stock, irrigation and municipal purposes.

2. West Yellowstone Landfill. This landfill, located on Forest Service land north of West Yellowstone, has been demonstrated to pollute ground water beneath the site with TDS, iron, manganese and lead. A plume of contaminated leachate is believed to be moving toward the Madison River. There is no use of ground water in the area. This landfill is expected to be closed. 233

3. Alder Dumpsite. High seasonal ground water exists. No control has been exercised over disposal of septic tank pumpings or hazardous waste in the past. This dumpsite is expected to close.

4. Stanford Dumpsite. High ground water levels exist at site. A study of alternative refuse disposal options was recently completed, but the site will probably remain in use for some time.

5. Sheridan Dumpsite. High seasonal ground water levels exist at the site. Negotiations on closing the landfill continue.

6. Sand Coulee Dumpsite. This dump is sited in an abandoned coal mining area with high ground water. The dump has been closed and efforts are being initiated to "cap" the fill with less permeable cover materials.

7. Cascade Landfill. The landfill sits adjacent to the Missouri River in an area of high ground water. This landfill is expected to close.

8. Helena Landfill. This landfill is situated in moderately permeable soils 30 feet above the ground water table. It is suspected that a leachate plume with high levels of nitrate is migrating north. Studies are continuing.

9. Scratchgravel Landfill. The landfill is situated in permeable soils 35 to 60 feet above the ground water. Samples indicate a leachate with high nitrate (15 mg/l) and high conductivity (1500 micromhos/cm). Studies are continuing.

10. Judith Gap Dumpsite. This open dump is located in a high ground water area. Studies are continuing.

11. Anaconda Landfill. The landfill lies adjacent to Warm Springs Creek in an area of high ground water. The landfill is still in use.

12. Plains Landfill. This landfill is located in a gravel pit with highly permeable soils. There is positive evidence that leachate is being found and a plume is probably moving toward the adjacent Clark's Fork River.

13. Butte Landfill. Samples have shown that ground water is being contaminated, but the extent of the problem is unknown. Remedial efforts have been taken to minimize the problem. Studies are continuing.

14. Big Timber Landfill. It is strongly suspected that a leachate plume from the site may be flowing toward the Boulder River. Studies are continuing. The site is expected to close.

15. Cut Bank Landfill. This landfill is located in an area of high ground water. The extent of contamination is unknown, but continued use of the site is expected.

C. Oil and Gas Exploration and Development Activity

Brines, often pumped with oil to the surface, have TDS levels ranging from 10,000 to 300,000 mg/l. They are disposed of by reinjection or by discharging into evaporation pits. Failures in either production well or injection well casings can allow brines to escape into aquifers containing good quality water. Unlined evaporation pits can allow brine to seep into shallow ground water. Spills of oil or brine at the surface can contaminate shallow ground wter.

One problem is on the Fort Peck Indian Reservation where poor injection practices in the 1950's have resulted in large increases in the TDS into the Foxhills Sandstone, which is locally used for domestic and agricultural purposes. Several wells have been abandoned.

Underground seismic exploration for oil and gas has resulted in a concern for ground water contamination. Shot holes are drilled less than 200 feet deep and explosives detonated during seismic testing. Each year thousands of seismic test holes are drilled throughout Montana. These shot holes create concern that shallow polluted ground waters (perhaps influenced by saline seep) will contaminate deeper, higher quality aquifers. Seismic shot holes have been found to partially plug themselves naturally as they cave in. There is still concern, however, that they allow surface water to enter aquifers, thus mixing different aquifers. There is also concern about contamination from chemicals used in explosives. It is expected that state rules will be established requiring shot holes to be filled.

D. Municipal/Industrial Wastewater Disposal

Many industrial and municipal wastewater disposal systems use facultative or aerobic lagoons or evaporation and seepage ponds. Wastewater percolating into the soil beneath these impoundments may pose a pollution threat.

An investigation completed in 1979 identified 676 surface wastewater impoundments in the state. The majority of these were less than 10 years old. Additional impoundments have been constructed in the last four years.

The impoundments in Montana range in size from 0.01 acre to about 700 acres. The largest are associated with mining and industrial operations and the smallest with oil and gas production and agricultural activities. Of the 676 impoundments, 154 were believed to pose ground water contamination potential. Only a small percentage were found to be lined or have ground water monitoring wells.

Results of the ground water contamination potential assessment indicated that: 1) Industrial and mining impoundments tend to be located on low ground near streams in alluvial sand and gravel and where ground water is moving toward the stream with no intervening water wells; 2) a very high proportion of oil and gas impoundments are located far from large streams and ground water aquifers; 3) a large proportion of other impoundments tend to be located on alluvium along the major river valleys; 4) most of the impoundments are associated with water that is a current drinking water source and 5) most of the wastewater that is put into the impoundments has low to medium health hazard potential.

There are localized impacts at some surface impoundments. For instance, the Champion pulp mill ponds northwest of Missoula introduce organic contaminants, measured as biochemical oxygen demand and color, to the Clark Fork River alluvial aquifer. It is also believed that the extensive tailing ponds at Warm Springs and Opportunity, associated with the abandoned Anaconda smelter, contribute heavy metals and dissolved solids to the local ground waters. However, the conclusions of the study were that surface waste water impoundments on a statewide basis had minimal impact on the quality of ground water in Montana.

Recently, more attention has been given to land application of wastes, particularly municipal wastewaters. The intent is to use the nutrients in wastewater as fertilizer, thereby eliminating or reducing surface water pollutants and achieving a higher level of wastewater treatment. Improper design or excessive land application rates, however, can cause ground water quality problems. Generally wastewater spray irrigation or sludge injection systems are designed so application rates or nutrients are balanced with accompanying crop uptake rates. Under this scheme heavy metal application rates are far below allowable limits.

1. Burlington Northern Krezelak ponds -- located east of Havre Mountain off Highway 2. Site was used for disposal of oil sludge and waste oil in unlined ponds. Site has a high ground water contamination potential.

2. Burlington Northern Racetrack Ponds -- located east of Havre off Highway 2. Site was used for disposal of sludge and waste oil. Site has a high groundwater contamination potential.

3. Carter Oil Company Refinery -- located in Cut Bank. Site is abandoned but has high ground water pollution potential from disposal of waste oil onsite.

4. Liquid Air, Inc. -- located in Missoula. Disposed of waste in an unlined pond. Site has a high pollution potential.

5. Morgan Chemical -- located 5 miles northwest of Great Falls, Montana south of I-15. Site used trenches to dispose of pesticides. There may be some ground water contamination.

6. Paradise Tie Treatment -- located in Thompson Falls. Disposed of waste products such as pentochlorophenol in ponds near the Clark Fork River. There is a high potential for ground water contamination. Contaminated ground water may end up in the river.

7. Borden Chemical Company -- located in Missoula. Site has liquid and solid waste disposal into a clay lined pond. There is a potential for contamination.

8. Great Western Sugar -- located in Billings in Section 10, T15, R26E. The site used 11 ponds to dispose of sugar mill waste. Several wells on the east side of the plant have been contaminated. Site was given a high pollution potential by the surface impoundment assessment study.

E. Accidental Spills and Leakage

Ground water pollution has also occurred due to accidental spills of contaminants, and from leakage from underground storage tanks. Many spills are not documented, therefore their nature and severity is unknown.

Described below are recently documented spills and leakages of contaminants to ground water. Many other instances of spills of pollutants to ground waters are believed to have occurred. Most are probably minor and their cumulative impact is known.

1. Billings. Phenol contamination of ground water allegedly exists at the Exxon refinery. An investigation is continuing.

2. Bonner. High arsenic levels were found in ground water. Levels were ten times the drinking water standard of 0.05 mg/l. Some domestic wells were found to be contaminated. The source is unknown and an investigation is continuing.

3. Bozeman. A gas station adjacent to Montana State University leaked gasoline into shallow ground water. A similar gas leakage problem continues to plague domestic water supplies on the west edge of town. Surface and ground waters have been contaminated with creosote and pentachlorophenol in the vicinity of Idaho Pole Company on the city's north side.

4. Broadus. Gasoline leaked into shallow ground water. Twelve inches of gasoline were found to overlay a shallow water table. Gasoline fumes existed in the county courthouse and nearby businesses. No wells were known to be affected by this leakage to date.

5. Conrad. A gasoline station lost approximately 12,000 gallons of gasoline in 1975. Gasoline fumes were found in a nearby basement.

6. Deer Lodge. Gasoline odors were detected in the municipal water supply in 1972. Apparently the municipal well casing leaked gasoline into the supply. Several thousand gallons of diesel fuel were also accidentally spilled from a tank car in 1970 or 1971.

7. East Helena. Slag piles at the ASARCO refinery are believed to be leaching chemicals into ground water.

8. Glendive. 18,000 gallons of diesel fuel were spilled on the ground in 1975. No detailed investigation of the spill was conducted.

9. Great Falls. Shallow ground water near the Falls Chemical Plant has been shown to contain low levels of 2,4-D. There is no use of ground water in the immediate area, but some trees have died around a nearby wetland.

10. Helena. Diesel fuel leaked into shallow ground water by the Burlington Northern Railroad appeared in a Helena storm drain and was discharged into city storm water infiltration ponds. There is no known use of ground water in the area.

11. Kalispell. Evergreen area ground water is believed to be contaminated by multiple sources. Spills of glue wastes at Plum Creek Plywood are believed to contribute to the problem.

12. Laurel. Petroleum products exist in ground water near the CENEX refinery.

13. Lewistown. Gasoline from a filling station leaked into shallow ground water and surfaced in the basement of an apartment building resulting in the evacuation of the building. There is no known use of ground water in the area.

14. Libby. Elevated levels of pentachlorophenol were discovered in irrigation wells. They were believed to arise from spills during pole treatment at St. Regis Lumber.

15. Livingston. Diesel fuel was discovered in a ground water drain that enters Sacajawea Lagoon.

16. Miles City. The Chicago-Milwaukee Railroad leaked diesel fuel into ground water over many years. The railroad has recovered about 350,000 gallons of fuel to date.

17. Missoula. A pressurized pipeline was discovered to be leaking in 1972. Approximately 126,000 gallons of gasoline were lost into the ground water.

F. <u>Agricultural Practices</u>

Saline seeps pose one of the greatest threats to ground water. It is caused by the dryland farming practice of summer fallowing. Natural vegetation is removed and excess soil moisture allowed to accumulate. Much of the land used for dryland farming is rich in natural salts which are susceptible to leaching. The excess moisture moves through the soil, dissolving the salts and becoming increasingly saline. The salty solution can and does contaminate ground water. Often the leached solution hits an impermeable geological formation, moves laterally downslope and emerges at the surface where it forms the familiar saline seep.

Saline seeps have caused great concern in the agricultural community due to the loss of productive land and salinization of freshwater reservoirs. Livestock can be poisoned from drinking this water. Also, farm and ranch families occasionally have had to abandon drinking water supplies that became too saline.

The pollution source map in Figure 4 shows the general areas where dryland farming occurs in Montana. Ground water can be contaminated by saline seep in any area where dryland farming takes place. Ground water can be severely degraded. TDS levels from 2,000 to 15,000 mg/l, sulfate levels of several thousand mg/l and nitrate levels ten times the drinking water standard of 10 mg/l have been observed.

Ground Water Use

Ground waters in North Dakota occur in the Dakota, Pierre and Fox Hills-Hell Creek aquifers of the Cretaceous age, the Fort Union Formation of Tertiary age and Glacial Drift aquifers of Quaternary age. Each of these aquifers yield water of economic importance in North Dakota.

The North Dakota State Water Commission has been collecting annual water use information since 1965. The total ground water usage in the state is approximately 121 MGD, which is 10% of the total water usage.

Ground Water Quality Concerns

North Dakota has not experienced any major ground water quality problems. Contamination of aquifers has been limited to small areas caused by bacteriological contamination of shallow aquifers by septic tank drain fields or leachate from solid waste disposal sites entering the ground water. Natural sources of contamination, including high uranium fluoride salts and arsenic are being discovered. A large portion of the state's ground water resources are located at a depth which better protects them from human-induced sources of pollution. The glaciated areas where shallow water table aquifers exist have experienced very few contamination problems due to the absence of industry and other detrimental land uses above these aquifers.

Although the state has encountered only minor ground water contamination incidents, the potential for future incidents exists. The North Dakota State Department of Health, in conjunction with the North Dakota Geological Survey, has completed a surface wastewater impoundment assessment and it indicated that many surface impoundments are sited in geologically poor conditions and therefore have high pollution potentials. Also, potential ground water quality problems exist in the western part of the state due to mining, oil and gas exploration and other energy related impacts.

1. Southeastern North Dakota Arsenic Issue: High levels of arsenic, above the drinking water standard of .05 mg/l have been reported in several wells in southeastern North Dakota. During the 1930's grasshoppers had been a serious problem in the area and were treated with a bait consisting of arsenic, bran and sawdust. Some of the arsenicals were collected and sent to companies for reuse or reprocessing. Small quantities of the arsenicals are discovered occasionally. There are reports of burial of these substances on farms. It is not known whether these arsenic compounds are the source or if the arsenic is naturally occuring. The State is investigating the site as a possible Superfund site.

2. Husky Industries, Inc., East of Dickinson, Stark County: Concern is with possible phenolic contamination of ground water from briquette operation.

3. Landfill near Grand Forks: Leachate containing toxaphene and possibly other pesticides from abandoned landfill drains on occasion into English Coulee, which drains into the Red River.

4. Sodium Chromate, Western North Dakota: Sodium chromate is used in oil well-drilling operations. Concern is with possible ground or surface water contamination from the chromium. Numerous well-drilling operations occur in the Region and the State is studying few sites to determine if there is a problem.

5. Valley City Landfill: Concern with ground water contamination due to solid waste leachates.

6. Amoco Refinery Sludge Dump, Mandan: Refinery sludges and waste only disposed of on site in ponds create ground water pollution potential.

7. North Ashing Site, six miles northwest of Belfield, Stark County: Concern about ground and air contamination by radium, uranium, elevated gamma radiation, molybdenum and other heavy metals from prior uraniferrous ashing operations.

8. South Ashing Site, Southeast end of Belfield, Stark County: Same as above.

9. Bowman Lignite Ashing Site, 7 miles west of Bowman in Griffin: Problem same as above.

Existing And Potential Ground Water Quality Problems

Due to the lack of adequate surface water supplies apart from the Missouri River, South Dakota relies on ground water for the majority of its needs. Shallow alluvial and glacial aquifers generally have the best water quality within the state although some bedrock aquifers associated with the Black Hills have good water quality. As a generalization, deeper aquifers have increasingly poor water quality with depth. The majority of the deep glacial and bedrock aquifers are unsuitable for irrigation. Unfortunately, the aquifers with the best water quality are also the most subject to contamination. Once large areas of an aquifer are contaminated, it is generally impractical to return the water quality to the original state. Therefore, it is extremely important that the shallow aquifers be protected from ground water contamination.

1. Leaking Artesian Wells

The Dakota Sandstone and other artesian aquifers underlie virtually the entire state. Many wells drilled into the Dakota once flowed at the surface but now no longer do so due to the decline in artesian head (water level drop due to declining pressure). Thousands of wells have been drilled into the Dakota and other artesian aquifers but many were improperly built and/or abandoned. There are from 12,000 to 15,000 artesian wells within the state that either continuously discharge to the surface or leak upward into other aquifers above them. This is one of the most serious ground water quality problems that the state faces. The water quality of the Dakota and other deep bedrock aquifers is generally considerably worse than that of the overlying shallow aquifers. Leakage from artesian wells upward into shallow aquifers can degrade the relatively good water quality in these shallow aquifers. The state needs to plug or cap these abandoned wells.

2. Non-Point Source Pollution

Many areas of South Dakota where sandy soils overlie shallow aquifers are showing increasing evidence of significant nitrate contamination. In Gregory County, every town in the county has at least one municipal well in which nitrate levels exceed the SDWA limit of 10 mg/l NO_3 as N. In the Big Sioux Basin, at least 11 wells serving public water supplies in shallow aquifers have nitrates in excess of this limit. The SD Office of Water Quality compiled nitrate data from 861 wells in Hamlin and Brookings Counties in the Big Sioux Basin and found that 239 wells (27 percent) exceeded the limit. Nitrate contamination of shallow aquifers due to non-point source pollution is probably the major ground water quality problem within the state and further research is needed to determine the extent and source of this pollution in order to implement measures to control this degradation of the otherwise usually good water quality of these shallow aquifers. A study is being conducted in the Big Sioux River Basin to define the nature, extent and health impact of this type of pollution.

3. Landfills

A review of the ground water contamination of existing solid waste disposal sites is needed and monitoring wells are recommended for sites where significant ground water contamination is likely (including monitoring wells for any new sites). Monitoring wells have been established at landfills near the towns of Brookings, Redfield, Mitchell, Milbank, Vermillion, Aberdeen, Canton, Gregory, DeSmet and Huron.

4. Urban Runoff

An urban runoff study is presently underway in the Rapid City area. While not designed to specifically address ground water pollution, this study should provide insight into reported problems with water quality in shallow wells in the lower Rapid Creek valley. In some instances, road salting can also cause ground water contamination.

5. Private Sewage Disposal Systems

The inadequate location, design, construction and operation of private sewage disposal systems such as septic tanks and their drainfields can cause localized ground water contamination problems. Rapid development of the Black Hills is presently occurring and many areas of the Black Hills are unsuitable for the placement of large numbers of closely spaced houses with individual sewage disposal systems. There are presently at least 60,000 septic tank systems in the state.

6. Private Wells -- Nitrates and Bacteria

In a study of rural wells in Aurora and Brule Counties, it was found that 46.7 percent of 122 shallow wells tested had nitrates in excess of the limit of 10 mg/l NO_3 as N and that 52.2 percent of 120 shallow wells tested for coliform bacteria had 30 or more coliforms per 100 ml. Very few complete water quality analyses are available for private wells. Trace element and organic water quality data is especially lacking. Further studies of private wells are needed to ascertain water quality problems which may be associated with these wells. There are at least 60,000 private wells for drinking water in the state.

7. Mining

The improper location and construction of impoundments for mining wastes can cause localized ground water pollution. For further discussion of this see the 1980 <u>South Dakota Surface Impoundment Assessment</u>. Extensive exploration is occurring in South Dakota for oil, gas and minerals, including uranium. DWNR estimates that approximately 2000 exploration holes are being drilled annually. Improperly plugged exploration holes can cause cross contamination of aquifer with water from a poor quality aquifer polluting an aquifer with water of better quality. Surface contaminants may also enter aquifers through improperly plugged exploration holes. Because of the potential magnitude of the problem, DWNR plans to implement a program to randomly check to determine if exploration holes are being properly plugged according to state regulations.

8. Industrial Activity

A variety of industrial sources can cause serious localized ground water contamination. These include leaking oil, gas and chemical tanks, chemical and petroleum spills from trucks and railroads, etc. It is recommended monitoring wells be required for any impoundment handling industrial wastes. To date, this has been done only on a limited basis because of the high cost of drilling the monitoring wells.

Hazardous Waste Sites

1. Black Hills Ordinance Depot: Large quantities of mustard gas were destroyed on the property. It has been reported that some mustard gas was poured directly on the ground.

2. Brookings Landfill: Leachate generation and ground water contamination potential.

3. Edgemont: Radon migration and construction-related use of uranium tailings in Edgemont and nearby Cottonwood Community. NRC has allocated funds for clean-up.

4. Highland Electric Company, Madison: Contamination of soil with polychlorinated biphenyls.

5. Landfill near St. Onge, Lawrence County: Several hundred 5-gallon cans of 1,2-dibromomethane mixed with diesel oil were dumped.

6. Rapid City Landfill: Suspected hazardous materials disposed at the site in the past.

7. Redfield Iron and Metal: Site receives scrap batteries and acid. Concern is with acid runoff from property.

8. Watertown City Landfill: Concern is with off-property contamination with leachate. Landfill receives some hazardous waste, including some empty pesticide containers.

9. Whitewood Creek, near Lead: Mining and ore extraction from gold operations over the past century have resulted in stream and ground water pollution.

Ground Water Use

While ground water is found throughout the state, the quantity and quality varies greatly. Aquifers in Utah range from unconsolidated sands and silts in the western deserts to consolidated carbonates and sandstones in the Great Basin in the eastern portion of the state.

These aquifers are recharged near the mountains and discharge down gradient with ever deteriorating quality as the water moves down gradient picking up additional salts. Because of the complex geology of Utah, aquifers do not extend over large areas. Rather, an aquifer is generally common to a single valley or a particular sub-area. Most of the water quality monitoring activities by the Bureau of Water Pollution Control are now limited to surface waters. However, a major ground water monitoring program has been underway for many years and is now being carried on by the Bureau of Public Water Supply. In addition, Salt Lake County has a Jordan Basin ground water study currently in progress.

A report from the Utah Water Research Laboratory by Edward P. Fisk, entitled, A Summary of Evaluation of Shallow Ground Water Contamination Hazards in the State of Utah, June 1981, deals with a survey to appraise human-induced contamination of shallow ground water in selected areas in Utah. The survey found a number of hazards to ground water do exist and included:

1) Shallow aquifers with the largest amounts of deleterious contaminants underlie cities and towns. 2) Agricultural areas generate greater quantities of dissolved salts and possibly other contaminants, but the contamination is spread over considerable larger areas and thus is more dilute. 3) Improper disposal ponds, mining operations and poorly managed solid waste dumps are serious hazards locally. 4) Septic and other wastes from recreational activities in the state are small but are an increasing hazard.

There is an arsenic problem of natural origin associated with the aquifers in the Hinckley-Delta area. Even though the level of arsenic exceeds both state and federal standards, a health effects study completed by the State Health Department in 1980 has shown that no statistically significant health effects are associated with the elevated levels of arsenic in the study area.

There are nitrate problems in the Cedar Valley area in Ironton County and the Cornish area in Cache County. With respect to Cedar Valley, the water is drawn from deep aquifers and the sources of nitrate contamination are unknown. The source of nitrate contamination near Cornish in Cache County is probably from the fertilization of agricultural areas in the vicinity of the spring water source.

A problem of fluoride contamination is associated with the Johnson water well system in Duchesne County as well as several private well sources in that area. The problem appears to be associated with the geologic formations from which the water is drawn.

Mining, Hazardous Wastes, Landfills, Leaking Underground Tanks, Agricultural Practices and Septic Tanks

1. Salt Lake County, Utah: Threats to Salt Lake County's important shallow aquifers occurs from the above sources. Under the 208 areawide water quality assessment, EPA is participating along with the state, county and USGS in an investigation of these sources. The adjacent copper mining activity is known to contribute increased levels of TDS and suspected of potential heavy metal increases. Various hazardous waste sites in the city include the Fenced Barrel Site (with 2 acres of 55-gallon drums containing pesticide wastes) the Rose Oil Sludge Disposal site and others. Municipal landfills in the county have allowed industrial waste disposal of toxic materials. A drinking water supply well developed by a home improvement district cannot be used because of elevated iron levels believed to be caused by an inactive landfill. Recent problems include leakage from underground gasoline storage tanks. Irrigation return flows are said to be increasing TDS concentrations. The community of Sandy has had to abandon two domestic wells due to higher TDS values. Poor septic tank cleaning practices are possibly adding trichloroethylene to the shallow aquifers.

2. Barrel Storage, 500 West North Temple, Salt Lake City: Full, partially full and empty containers on site. Labels indicate a number of hazardous chemicals.

3. Defense Depot, Ogden: Possible problems from handling hazardous wastes in the past.

4. Duchesne: Six pond sites received oil and brine water wastes. Citizen alleged that private well was contaminated by waste disposal.

5. Fenced Barrel Site, Southeast of main railroad yard of Union Pacific, Salt Lake City: One to two acres of discarded 55-gallon drums. Labels indicate 2,4,D-Butyl Ester, herbicides, Thiorol-Oxydizers and other herbicide containers.

6. Old Cobalt Tailings Pond, Magna: Possibility of ground water contamination from cobalt refinery tailings.

7. Roosevelt, east of Neola Highway, 1 mile north of Roosevelt: Oil and brine waste deposited in 1 1/2 acre pond. Citizen complaint of private well having been contaminated.

8. Rose Park Canals, Salt Lake City: Buried city sewage canals cutting across approximately ten blocks of housing developments. Concern is with ground water contamination and eruption of disposed materials in the housing.

9. Rose Park Oil Sludge Dump, Salt Lake City: Approximately 5-acre site used to bury refinery oil wastes to depth of 14 feet. Site was used for disposal until 1957 when Salt Lake City bought it. Most of the site is capped. Possible ground water contamination. EPA has authorized additional clay cap and clay barriers under the Superfund program.

10. Valley Landfill, Salt Lake City (active): Concern is with possibility of ground water contamination. Landfill receives municipal and industrial waste including hazardous and toxic wastes.

11. County Landfill, Salt Lake City (inactive): Possible ground water contamination.

12. West Valley Landfill, West Valley: Gasoline vapors travelling along sewer lines have entered homes and businesses causing evacuations.

13. Atlas Mineral Corporation Mill Site, Moab: An active mill site owned by the Atlas Mineral Corp. Radon migration and construction-related use of uranium mill tailings in the town are the concerns. Possible alluvial aquifer contamination due to uranium and daughter products.

14. Green River Uranium Mill Tailings, 39 acres near Green River: Inactive uranium mill tailings containing residual radioactive materials.

15. Inactive Mill Site and Town, Monticello: Inactive uranium mill site cleaned up by AEC in the past. There are mill tailings and ore debris still left in the town.

16. Uranium Mill Tailings, Thompson: Same as above.

17. Vitro Uranium Mill Tailings, 230 acres southwest of Highway 163 near Mexican Hat: Inactive uranium mill tailings containing residual radioactive materials.

18. Bay Area Refuse Disposal, West Bountiful: Disposal site received low levels of caustics, hydrocarbon sludges, office and construction trash. Possible ground water contamination.

19. North Davis County Landfill, Layton City: This landfill received mostly municipal waste and a small quantity of hazardous waste. Possibility of ground water contamination.

20. Trojan Division (Gomex), Spanish Forks: Facility owned by IMC Corporation, Trojan Division. Site received over 10,000 gallons of 5% nitric acid waste. Possibility of ground water pollution.

21. Woods Cross Refinery, West Bountiful: Phillips Petroleum owns the site. Facility contains some chemical and cleaning waste from fuel tanks. Possible soil and ground water pollution.

Ground Water Use

Ground water is an extensively used resource throughout Wyoming and its use is growing. Approximately 65% of Wyoming's population depends on ground water as the source for its domestic water use. The state's livestock industry is heavily dependent on ground water. The energy industry of Wyoming utilizes ground water in power generation, secondary and tertiary oil recovery and uranium mining and processing. Although the ground water used for irrigation is a small percentage of the total amount of water utilized for this purpose, it still accounts for almost half of the state's total ground water use.

Wyoming has over 50 separate geological formations ranging in age from Pre-Cambrian to Quaternary, which are presently serving as drinking water aquifers. Taking into account the numerous structural basins that separate the geologic formations into distinct aquifers, that number increases to over 150 aquifers. Depending on the definition of the areal extent of an "aquifer", and taking into account faulting, alternating sand and shale, lenses, "leaky" aquitards and the numerous pockets of Quaternary alluvial "aquifers" the number of drinking water "aquifers" could easily surpass 1,000.

Hazardous Waste Site Summaries

1. AMOCO Refinery Dump, Casper: Dump is across the North Platte River from the refinery. Dump contained unknown refinery type wastes. Wyoming Solid Waste Program reports that the drums are removed and that oily dirt at the site is now spread on a landfill. Clean up is completed, monitoring results are needed to determine success.

2. Horse Creek, near Laramie: Site contains two railroad tankers filled with carbolic acid that were derailed in 1975. The railroad buried the cars. Concern over possibility of ground water contamination.

3. Old Refinery, Newcastle: Petroleum hydrocarbons in storm sewer lines.

4. Porcupine Creek Mine, Big Horn Mountains near Lovell: Concern is with contamination of ground with mercury from gold mining operations. State of Wyoming will evaluate this site.

5. Riverton Sulfuric Acid Plant, SW of Riverton, Fremont County: Possible sulfuric acid discharge into ground water in late 1950's from Susquehanna Western Company (now defunct).

6. Southwestern Refining Company, La Barge: Potential for ground water contamination due to refinery disposal activities.

7. Union Pacific Railroad, Laramie (Creosote Plant): Report of discharge of creosote into the Laramie River. Possible discharge of organics to alluvium.

8. Riverton Uranium Mill Tailings: Inactive uranium mill tailings containing residual radioactive materials.

9. Split Rock Uranium Mill Town, Jeffrey City: Uranium mill tailings and ore debris from twenty-five year old Western Nuclear Corporation mill site have contaminated the town. Tailings pond has caused ground water contamination which is moving off-site.

10. Spook Site, Converse County: Inactive uranium mill tailings containing residual radioactive materials.

11. Casper City Dump: Landfill received hazardous waste, such as tank bottom sludges, waste oils and solvents, acids and pesticides. Dump has two lagoons for waste disposal. Municipal waste is disposed there too. Hazardous waste disposal reported to have ceased in January 1980. Concern over possible surface and ground water contamination as well as air pollution.

12. Leefe Plant (Mailing Address: Star Route, Randolph, UT 84064): Site receives phosphate mining and ore beneficiation waste from the owner, Stauffer Chemical Company. Possible ground and surface water contamination.

V.

Superfund Section
Hazardous Wastes - Inactive Sites
Environmental Management Report

Superfund Section (continued)
Hazardous Wastes - Inactive Sites

IV.

HAZARDOUS WASTES - INACTIVE SITES (SUPERFUND)
REGION VIII ENVIRONMENTAL MANAGEMENT REPORT

PART 1

STATUS (I), TRENDS (II), PROGRESS TO DATE (III)

I. SUMMARY OF STATUS

A. NATIONAL PRIORITIES LIST (NPL) (PROPOSED)

Region VIII has 14 sites on the proposed National Priorities List (NPL). Six are located in Colorado, 4 are located in Montana, and Utah, Wyoming, North Dakota, and South Dakota--each have one site. The Region has mining sites and one radiation site in addition to the more traditional inactive and abandoned hazardous waste sites (e.g., landfills). Mining sites are treated somewhat differently from other NPL-listed sites. Enforcement actions must be exhausted under CERCLA and other environmental laws before expenditure of the fund can generally occur. Figures 1 - 8 show the location of the NPL-listed sites throughout Region VIII (graphs 1 and 2).

B. HIGH PRIORITY SITES NOT ON THE NPL

Region VIII has sites that require attention even though they are not on the proposed NPL. These are Lowry Landfill, Denver; Canon City (Lincoln Park, Colorado); 2 radiation-contaminated structures in Monticello, Utah; Rocky Mountain Phosphate, Garrison, and the ASARCO smelter complex, East Helena, Montana. Lowry Landfill, a potential groundwater contamination problem, the radiation-contamination structures at Monticello, Utah, and Rocky Mountain Phosphate, a potential surface and groundwater contamination problem, were nominated for the NPL. They did not score high enough using EPA's hazard ranking system primarily because of population. Canon City (Lincoln Park), a groundwater contamination problem, required additional information to complete a proper evaluation. That information has been collected and the site will be evaluated. The Region expects to submit the ASARCO smelter at the NPL's initial quarterly update. Our evaluation could not be completed in time for the publication of the proposed NPL. Figures 2, 4, and 6 show the location of these sites throughout the Region.

C. FEDERAL FACILITIES

Seven Federal facilities are actual or potential public health and environmental concerns to this Region. Three are located in Colorado: Rocky Mountain Arsenal (Denver) and Pueblo Army Depot (Pueblo) owned by the Army, and the Leadville Drainage Tunnel (Leadville) owned by the Bureau of Reclamation. Four Department of Defense facilities in Utah are also of concern. These are Dugway Proving Ground, Tooele Army Depot, Ogden Army Depot, and Hill AFB. In each case, actual or potential contamination of surface and groundwater exists. Figures 2, 3, and 4 show the location of these sites within Region VIII. Under a CERCLA Presidential Order, the Department of Defense has been asked to implement response actions at their facilities. EPA remains involved, however, because the agency still is responsible for ensuring protection of the environment and public health.

The Region, Colorado Department of Health, Shell Chemical Company, and Department of the Army (DA) have entered into a formal agreement which provides the basis for addressing and correcting contamination problems at Rocky Mountain Arsenal. The Bureau of Reclamation has been asked to develop and implement a response action at the Leadville Tunnel concurrently with EPA's efforts at the NPL-listed California Gulch site. These latter two sites impact each other.

EPA retains RCRA authority over all Federal facilities.

D. ASSESSMENT AND INVESTIGATION OF POTENTIAL PROBLEM SITES

The Region will visit and assess the potential contamination problem at every known inactive or abandoned hazardous waste site during FY-83 and FY-84. The ERRIS system will be the list of sites from which the Region will work. Approximately 575 sites are listed on ERRIS within Region VIII. Of these sites, approximately 250 sites require some type of initial assessment. If past experience remains current, about 125 of these sites will require a visit to complete our evaluation.

EPA is providing the states within Region VIII a one-time allocation to assist in our evaluation effort (3012 allocation). States must submit their request for this Superfund money within the next 90 days. The money will be distributed to the States based on the number of sites within that state listed on ERRIS. Colorado can receive up to $155,000 (highest amount); North Dakota can receive up to $25,000 (lowest).

Almost half of the ERRIS listed sites are located in Colorado (239); North Dakota and South Dakota have the fewest sites (approximately 35 each). Mining, radiation, and the "traditional" sites (e.g., chemical waste problems) compose this list (Graph 3).

II. TRENDS

EPA initially published its list of sites eligible for Superfund money in October 1981. It contained 115 sites of which 4 were from Region VIII. These were the Denver Radium Site, Colorado; Whitewood Creek, South Dakota; Arsenic Trioxide Site, North Dakota; and Rose Park, Utah. In July 1982, 45 additional sites were added. Three sites in Region VIII were included in this addition: Marshall Landfill, Woodbury Chemical Company site, and the Central City-Idaho Springs Mining District. These additions are all located in Colorado. In December 1982, the proposed NPL was published containing 418 sites. Fourteen of these sites are located in Region VIII.

III. PROGRESS TO DATE

The Region has completed efforts at NPL-listed, other high priority, and Federal sites which have or will yield positive environmental results.

A. NPL-LISTED SITES

1. Arsenic Trioxide site, Southeastern North Dakota: The State is continuing its remedial investigation under terms of the cooperative agreement. This effort is on schedule.

2. Whitewood Creek, Black Hills area, South Dakota: The contractors selected by the State, EPA, and Homestake Mining Company to complete the remedial investigation began field work in late March. This effort is being conducted in accordance with the agreement reached among the three parties.

3. Union Pacific/J. H. Baxter site, Laramie, Wyoming: The settlement between the State and Union Pacific and Baxter to implement a remedial investigation and remedy has been started. The Region is expecting to initiate negotiations with the parties to undertake measures to abate contaminants leaking from unlined ponds concurrently with their remedial investigation.

4. Rose Park, Salt Lake City, Utah: The slurry wall surrounding the sludge pit has been constructed. The clay cap construction began in late April. Its installation is scheduled for completion in July.

5. Libby Groundwater site, Libby, Montana: A potentially responsible party has verbally agreed to conduct a remedial investigation at this site beginning in May. An administrative order under 106 of CERCLA has been drafted.

6. Anaconda Smelter, Anaconda, Montana: The Region believes that a remedy will be required to abate contamination at this facility. The Region is meeting with the company to develop an administrative order to address our contamination control concerns at this site. An existing agreement with Anaconda provides for the company and EPA to perform a remedial investigation at the site.

7. Milltown Groundwater site, Milltown, Montana: A cooperative agreement is being prepared proposing a remedial investigation, feasibility study, and Initial Remedial Measure (IRM). The IRM will provide an alternate water supply for families who are presently paying for bottled water. Their original water supply has become contaminated with arsenic. The draft cooperative agreement was completed in April and is in Headquarters for concurrence.

8. Silver Bow Creek, Butte area, Montana: A cooperative agreement is being prepared to cover a remedial investigation and feasibility study. Our objective is to have the draft cooperative agreement completed by June 15.

9. Denver Radium Site, Denver, Colorado: The action memorandum authorizing expenditure of about $220,000 of Superfund money was approved. The money will be used to complete the feasibility study. The State's submission was finalized April 15.

10. Marshall Landfill, Boulder County, Colorado: Browning-Ferris Industries has verbally agreed to complete the remedial investigation, feasibility study, and remedy, as required. Our objective is to have a signed agreement by May 20.

11. Woodbury Chemical Company site, Denver, Colorado: EPA awarded Superfund money to complete the remedial investigation, feasibility study, and two initial remedial measures (IRMs). The site will be fenced to restrict access, and a temporary clay cap will be installed to prevent additional spread of contaminated soil by precipitation or surface water run-off.

12. Central City-Idaho Springs Mining District Site, Clear Creek County, Colorado: EPA awarded Superfund money to complete the remedial investigation and feasibility study.

13. California Gulch, Leadville, Colorado: The Region met with the Bureau of Reclamation to determine their commitment to jointly finance remedial work with responsible parties associated with the Superfund site. The Bureau of Reclamation owns a tunnel which discharges contaminants into the Arkansas River a few miles upstream from the California Gulch discharge. Any remedial action addressing California Gulch should also address the Bureau of Reclamation's discharge. The Bureau of Reclamation agreed to participate. The Region will meet with responsible parties to negotiate their participation in a remedial investigation and feasibility study of California Gulch.

The Region sampled drinking water sources potentially contaminated by California Gulch during February. Results are being evaluated.

14. Sand Creek Industrial Site, Denver, Colorado: The Region initiated discussions with a potentially responsible party concerning a portion of this site. A responsible party search for the site will be completed during June. At that time, the Region will initiate negotiations.

B. HIGH PRIORITY SITES NOT ON THE NPL

1. Lowry Landfill, Denver, Colorado: The Region is conducting a quarterly sampling of groundwater. That information is being used by the City and County of Denver to develop a remedy. The State of Colorado and the Region are reviewing their proposal as it becomes finalized.

2. Rocky Mountain Phosphate, Garrison, Montana: At the Region's prodding, the property owner made arrangements with private contractors to remove the hazardous materials from this site. Some removal has occurred. The remaining hazardous materials will be removed over the next several months under a CERCLA 106 Order expected to go out in mid-May.

3. Anaconda Smelter, Great Falls, Montana: Under a formal agreement between the State of Montana, EPA, and Anaconda Minerals Company, that company completed a site investigation in September 1982. The results of this investigation are being reviewed by the parties. Subsequent work will depend on conclusions developed by this review.

4. ASARCO Smelter, East Helena, Montana: The Center for Disease Control has indicated that they will conduct a lead blood level study of 1-5-year-old children during the spring of 1983. The Region and ASARCO are discussing the approach to be taken to investigate potential lead contamination of soil and surface and groundwater.

5. Monticello Radiation problem, Utah: The Region will complete a health risk assessment of the private home and catalogue store during May 1983. Subsequent work will depend on results of this assessment.

6. Canon City, (Lincoln Park), Colorado: The Region is reviewing a recently completed assessment of groundwater contamination at Lincoln Park. Subsequent work will depend on results of this review.

C. FEDERAL FACILITIES

1. Leadville Tunnel, Colorado: Please see discussion under the Superfund site, California Gulch.

2. Rocky Mountain Arsenal, Denver, Colorado: EPA, the Colorado Department of Health, Shell Chemical Company, and Department of the Army signed a formal agreement in December 1982. This agreement provides the mechanism to investigate and mitigate contamination problems on and off-site resulting from arsenal activities.

D. ASSESSMENT AND INVESTIGATION OF POTENTIAL PROBLEM SITES

EPA completed a screening of information on 103(c) notifications. These sites were divided into low, medium, and high priorities for subsequent assessment if not previously completed. The Region had completed assessments at essentially all of the medium and high priorities. Most of the high priority sites had been nominated for the NPL.

High priority sites are sites located near populated areas, known to be involved in hazardous waste treatment, storage, or disposal and expected to impact surface and groundwater. In April 1981, EPA had required past and present owners and operators of hazardous waste sites, generators and transporters of RCRA hazardous wastes to notify EPA of their activities if not done previously by implementation of RCRA. Section 103(c) of CERCLA was the statutory basis for this requirement.

PART 2

I. MOST SIGNIFICANT PROBLEMS

A. NPL

Map Key	Site	State	Page
1	Denver Radium Site	Colorado	23
2	Woodbury Chemical Company Site	Colorado	23
3	Sand Creek Industrial Site	Colorado	23
4	Marshall Landfill	Colorado	23
5	Central City-Idaho Springs Mining District	Colorado	22
6	California Gulch	Colorado	22
7	Rose Park	Utah	23
8	Union Pacific/J.H. Baxter site	Wyoming	25
9	Libby Groundwater site	Montana	26
10	Milltown Groundwater site	Milltown	26
11	Anaconda Smelter site	Montana	26
12	Silver Bow Creek site	Montana	26
13	Whitewood Creek	South Dakota	24
14	Arsenic Trioxide site	North Dakota	28

B. HIGH PRIORITY SITES NOT ON THE NPL

A.	Lowry Landfill	Colorado	22
B.	Monticello Radiation	Utah	24
C.	Rocky Mountain Phosphate	Montana	26
D.	Anaconda Smelter (Great Falls)	Montana	26
E.	ASARCO Smelter	Montana	26
F.	Canon City (Lincoln Park)	Colorado	22

C. FEDERAL FACILITIES

I	Rocky Mountain Arsenal	Colorado	23
II	Pueblo Army Depot	Colorado	22
III	Odgen Army Depot	Utah	24
IV	Tooele Army Depot	Utah	24
V	Hill Air Force Base	Utah	24
VI	Dugway Proving Grounds	Utah	24
VII	Leadville Drainage Tunnel	Colorado	22

D. ASSESSMENT OF POTENTIAL SITES

The Region has tentatively identified about 140 sites as requiring no further work (see graphs 3 and 6).

II. IMPLICATIONS FOR AGENCY MANAGEMENT

1. NPL

The State must provide a match, assure proper disposal (if required by the response action), and operation and maintenance costs (if required by the response action) before Federal Superfund money can be awarded to the State. States may not be able to meet these requirements.

The fund will be spent after 7 years. It is possible that some projects may not be completed before the fund is exhausted.

2. HIGH PRIORITY SITES NOT ON THE NPL

If a site is on the NPL, EPA needs to show only that a release may or has actually occurred. If a site is not on the list, EPA must locate a "deep pocket" responsible party to mitigate the problem.

3. FEDERAL FACILITIES

Federal agencies often find it difficult to devote resources to clean up their problems. The Federal Government, however, must set the example if it expects cooperation from private industry.

III. PROBLEM DISTRIBUTION

A. NPL - (See Figures 1 - 8)

B. High Priority Sites Not On The NPL - "

C. Federal Facilities - "

D. Assessment and Investigation of Potential Problem Sites

(See Graphs 3 and 6.)

ATTACHMENT A

PROBLEM DISTRIBUTION BETWEEN STATES

A. NATIONAL PRIORITIES LIST

Each state has at least one site on the proposed NPL. Colorado has 6 sites; 5 of them are within the Denver Metropolitan area. Montana has 4 sites. Each of the remaining 4 states has 1 site (Figures 1-8).

B. HIGH PRIORITY SITES NOT ON THE NPL

Of the 6 sites, Montana contains 3, Colorado has 2 and Utah has 1. Wyoming, North Dakota and South Dakota do not have sites (Figures 1-8).

C. FEDERAL FACILITIES

Colorado has 3 sites and Utah has 4 sites. Six of the sites are Department of Defense facilities. The remaining site, Leadville Tunnel in Colorado, is owned by the Bureau of Reclamation (Figures 2, 3, and 4).

D. ASSESSMENT OF POTENTIAL SITES

Colorado has almost as many sites as the remainder of the Region combined (see Graphs 3 and 6).

ATTACHMENT B

I. NATIONAL PRIORITIES LIST (NPL)

A. DENVER RADIUM SITE, CO (FIGURE 3):

While reviewing a 1915 U. S. Bureau of Mines report during late 1978, an EPA investigator discovered reference to a National Radium Institute located in Denver, Colorado. During 1979, the Colorado Department of Health undertook a large scale investigation of the issue. With considerable support from other State and Federal agencies (including EPA, DOE and USGS), 35 Colorado locations were identified where radium was processed, refined, or fabricated into various devices or products. Thirty-one of these locations are in the City and County of Denver and include vacant land, industrial operations, buildings, and public streets. Results from the EPA gamma scanning van, DOE aerial radiometric survey, USGS core sampling, and numerous other investigation activities indicated where additional survey work was needed.

In June 1981, EPA entered into a cooperative agreement funded with RCRA money with the Colorado Department of Health whereby EPA funded 95% of the remedial action planning for the 31 locations. With an amendment to the cooperative agreement, additional funds were provided for completion of the work, and a new effort (study of disposal site alternatives) was added. Engineering assessments and remedial action plans have been accomplished. The disposal site alternatives report will also be available soon. The site was listed on the Interim National Priorities List and is on the proposed National Priorities List. The Denver Radium Site has always been an important consideration during the Superfund legislation development, and specific mention of the site is included in the enacted languqge.

The issue has received strong local, state, and Congressional support for resolution. The initial remedial work was funded under a $105,000 grant, of which the state contributed $5,000. The work included a one-time $17,000 amount for community relations development. An additional $173,000 was added, making the total obligated to date $278,00. In August 1982, the State submitted a cooperative agreement which proposed taking response actions at five of the locations. EPA has not acted on that submission. The Agency indicated that the State should request an amendment to the existing cooperative agreement for conducting a feasibility study. The State is preparing that amendment.

B. WOODBURY CHEMICAL COMPANY SITE, CO (FIGURE 3):

The Woodbury Chemical Company, a pesticide formulation facility in Commerce City, Colorado, was destroyed by fire in 1965. Fire debris and rubble, including water-soaked bags of pesticides, were disposed on in an adjacent vacant lot. Soil samples taken in the lot have high levels of aldrin, endrin, heptachlor, and toxaphene. Site security is non-existent. The waste is uncovered. The potential exists for contamination of groundwater and surface water.

The State submitted a cooperative agreement to conduct a remedial investigation and feasibility study, and complete two initial remedial measures. The site would be fenced to restrict access and a temporary clay cap would be placed over the contaminated soil to prevent further spread of the contamination by surface water runoff. EPA obligated Superfund money so that the State can complete all of these tasks.

C. CENTRAL CITY-IDAHO SPRINGS MINING SITE, CO (FIGURE 2):

Acid drainage from a number of abandoned gold mines is contaminating Clear Creek with heavy metals. The Argo Tunnel in Idaho Springs and seven mine adits in the Central City area have been identified as sources. Both surface water and groundwater drinking supplies are affected by this site. The substances of concern include dissolved copper and cadmium.

The State submitted a cooperative agreement to conduct a remedial investigation and feasibility study. EPA obligated Superfund money so that the State can complete both of these efforts.

D. CALIFORNIA GULCH, CO (FIGURE 2):

California Gulch, located in the Leadville Mining District, has been seriously impacted by lead, silver, zinc, copper, and gold mining activities. Numerous abandoned mines and mine tailings piles are located in the gulch. The most serious water quality problem in California Gulch is acid mine drainage from the Yak Tunnel, a 3.4-mile tunnel that was constructed from 1895 to 1909 for the purpose of exploration, transportation of ore, and mine drainage. There are known connections from 17 mines to the tunnel. There is a continuous discharge of approximately 1-3 cfs from the tunnel to the California Gulch. This flow has a low pH (3.19-5.40) and high concentrations of dissolved metals including iron, lead, zinc, manganese, and cadmium. California Gulch is tributary to the Arkansas River. There is concern about the potential for contamination of domestic groundwater supplies in the California Gulch area, the adverse impact of fish in the Arkansas River, and potential adverse impacts on livestock and crops that are grown on agricultural land which is irrigated using water from the Arkansas River.

E. SAND CREEK INDUSTRIAL SITE, CO (FIGURE 3):

The Sand Creek Industrial Site occupies more than 300 acres in Commerce City, Colorado. Most of the site is industrially zoned and has supported a high volume of chemical and petroleum production. The site includes the former Oriental Refinery, the 48th and Holly Street landfill, the Colorado Organic Chemical Corporation, acid waste disposal pits used by the L. C. Corporation, and several small residences and businesses. The area has been the subject of health and environmental concerns for the past seven years. Investigations by the Tri-County District Health Department and the Colorado Department of Health have linked groundwater, surface water, and soil contamination at the Sand Creek Industrial site with four major facilities listed above.

The principal contaminants which may be present at the site include petroleum derivatives, methane, sulfuric acid, and pesticides. In June 1982, the U. S. Environmental Protection Agency initiated a study to characterize the contamination. Surface water, groundwater, and soil samples were taken.

F. MARSHALL LANDFILL, CO (FIGURE 3):

Marshall Landfill occupies 160 acres in Boulder County approximately three miles southeast of the City of Boulder. The site has been a landfill since 1965. The northern 80-acre portion was operated by a succession of four operators from 1965 to 1974. The landfill accepted municipal waste, unstabilized sewage sludge, and many unknown potentially hazardous wastes. In 1974 the northern portion was closed, and the 80-acre portion to the south opened. Since 1975, Landfill, Inc., a subsidiary of Browning-Ferris Industries, has operated the active site. The landfill presently accepts only municipal waste and occasionally sewage sludge from the Boulder wastewater treatment plant.

A concern at Marshall Landfill is the potential for contamination of the alluvial and Fox Hills aquifers. Contamination has been detected in the alluvial groundwater on-site. Samples from wells, seeps, and a drain at the landfill have all shown elevated levels of priority pollutants, mainly the volatile organics. Contamination of the Fox Hills aquifer beneath the site has not been confirmed.

Surface water on-site in lagoons and Community Ditch, an unlined irrigation ditch, is contaminated. The type of contamination is similar to that for the groundwater. In 1980, EPA and the State concluded that there was no imminent and substantial endangerment to surface water users several miles downstream from the landfill because contaminants could not be detected at these locations.

The extent of the off-site groundwater contamination is not known. The alluvial and Fox Hills aquifers serve commercial, industrial, agricultural and domestic needs. Municipal water is not available for the homes near Marshall Landfill.

G. SILVER BOW CREEK, MT (FIGURE 6):

Silver Bow Creek, from the confluence of Copper Creek in Butte, Silver Bow County, Montana, to the Warm Springs Ponds, northeast of Anaconda, Deer Lodge County, has received industrial, agricultural, municipal, and private waste for over 100 years. Numberous studies by local, State, and Federal agencies have sought solutions for the multiple sources of pollution. Some progress has been achieved in the treatment of industrial and municipal wastes to reduce impacts to the creek, and more importantly, the impacts of the creek itself on the upper Clark Fork River into which it drains. However, recent investigations indicate that contaminants such as heavy metals and phosphates continue to pose a threat to public health, and the aquatic environment of the creek itself.

The Department of State Lands is trying to remove some of the abandoned mine tailings from the banks of the Silver Bow Creek. Although this may help rehabilitate some of the creek, further work is needed to define contaminant sources and amounts.

H. MILLTOWN, MT (FIGURE 6):

In May 1981, environmental health officials of Missoula County took routine samples from seven drinking water wells in Milltown, Montana. Four showed levels of arsenic, according to the analyses of the State Department of Health and Environmental Sciences (DHES), that exceeded the Interim Primary Drinking Water Standard. Subsequent analyses by DHES confirmed that the four wells, serving a total of 35 residences, were contaminated with up to 10 times the standard of 0.05 milligrams arsenic per liter (mg/l). Residents were advised to seek alternate supplies of potable water. Other uncontaminated wells in the area are apparently not capable of suppling the Milltown consumers.

Possible sources of contamination are leachate from an abondoned landfill located east of town (contents unkown) or solution of metals from mill tailings (sediments) deposited behind Milltown Dam located south and immediately adjacent to the town on the Clark Fork River. Analyses of these sediments show total recoverable arsenic levels of up to 148 mg/l. No samples of the landfill have yet been taken.

Milltown is located on an alluvial isthmus between the Clark Fork River and the Blackfoot River. Groundwater hydrology is principally influenced by these two surface streams, and the principal subsurface strata are cobble and boulders.

I. LIBBY GROUNDWATER, MT (FIGURE 6):

The Libby Groundwater site is located in Libby, Montana. In April 1979, in response to a homeowner's complaint of an irritating "creosote" odor in water from a new well, the State Water Quality Bureau found elevated levels of pentachlorophenol. The problem was later referred for preliminary investigation through the Uncontrolled Sites Program under Section 7003 of the Resource Conservation and Recovery Act (RCRA) of 1976. In September 1980, representatives of the U. S. Environmental Protection Agency (EPA), Lincoln County, and St. Regis Paper Company discussed possible sources of contamination, including past disposal practices for creosote and other preservatives formerly used to treat wood.

In June 1981, EPA and County officials tested 11 wells in the Libby area with portable field instruments. Based on those readings, grab samples from eight wells were analyzed by a State lab for pentachlorophenol (PCP) and polynuclear aromatic hydrocarbon (PAH) components of creosote. Three wells showed detectable levels of these contaminants, and two approached or exceeded proposed ambient water quality criteria for PCP. All of the wells tested are primarily used for irrigation.

J. ANACONDA SMELTER, MT (FIGURE 6):

The Anaconda Company copper smelter at Anaconda, Montana, operated from the late 1800's until it closed September 29 1980. For the most part, the wastes left on-site at closure remain. The State of Montana and the U. S. Environmental Protection Agency (EPA) are concerned over possible release of hazardous substances from the wastes into the environment. The Anaconda Company voluntarily entered into an agreement with EPA and the State for a study to identify and quantify any such substances. The sampling has been completed, the analyses are underway.

K. ARSENIC TRIOXIDE SITE, ND (FIGURE 8):

The Lidgerwood-Wyndmere-Rutland area of southeastern North Dakota generally has been found to have higher than average levels of arsenic in the shallow groundwater aquifers. Arsenic in most drinking water in North Dakota is below detectable limits; however, arsenic levels exceeding maximum contaminant levels set by Federal drinking water standards have been identified in the Lidgerwood city water supply. Rutland and Wyndmere water supplies contain the maximum acceptable limit of arsenic. Numerous private wells on farms in the general area also exceed the maximum contaminant levels. The specific source of arsenic has not been identified.

Heavy grasshopper infestations in the 1930's resulted in large and repeated applications of arsenic-based poisons such as arsenic trioxide in affected areas across the Midwest. Dated or excess poison was not ordinarily disposed of in what today is considered a responsible manner. Poisons were often buried near shallow groundwater aquifers, left unmarked in outbuildings, hauled to open dumps such as abandoned gravel pits, or thrown in low, agriculturally unproductive lands. Southeastern North Dakota was particularly hard-hit by grasshoppers in the 1930's and use of the arsenic trioxide was widespread.

L. WHITEWOOD CREEK, SD (FIGURE 7):

Over 100 years' worth of gold mining and mill tailings were discharged into Whitewood Creek in the Black Hills area of South Dakota. The U. S. Environmental Protection Agency (EPA) and South Dakota are concerned about potential health and environmental impacts from contaminated soil, groundwater, and surface water. Under a voluntary agreement, EPA, the State of South Dakota, and Homestake Mining Company are proceeding with a remedial investigation along the segment of the creek designated as the site. The investigation will seek to identify the location and state of tailings materials, the existence and forms of substances, and the potential for human health or environmental problems.

M. ROSE PARK, UT (FIGURE 3):

The Rose Park site, located in a city park on Boy Scout Drive in Salt Lake City (population 150,000), Utah, was used for the disposal of petroleum wastes from the 1920's until 1957. Sludges were placed into unlined pits and sometimes covered with lime and soil. The sludge exposed at this site is a hazard to park users by direct physical contact.

Agreement was negotiated whereby AMOCO Oil Company will construct a slurry wall and clay cap around the sludge. Construction is scheduled for completion in July of 1983. The site has been fenced to prevent access and construction is under way.

N. UNION PACIFIC/BAXTER, WY (FIGURE 5):

The Union Pacific/Baxter Tie Treating facility, located just southwest of Laramie (population 26,000)), Wyoming, has been operating since the 1880's. The site includes unlined surface impoundments that contain one million cubic feet of waste. Pollutants, including pentachlorophenol, benzene, naphthalene, toluene, and phenol, have migrated from the ponds, contaminating shallow groundwaters and the Laramie River.

II. HIGH PRIORITY SITES NOT ON THE NPL

A. LOWRY LANDFILL, CO (FIGURE 2):

Lowry Landfill, located in Araphahoe County, is approximately 15 miles southeast of Denver. It was formerly a part of the U. S. Air Force Lowry Bombing Range which was deeded in July 1964 by the U. S. Department of Health and Human Services, to the City and County of Denver to be used for "public health purposes". Until July 30, 1980, Lowry Landfill, under the management of the City and County of Denver, received all types of domestic industrial wastes, including up to 10 million gallons of liquid chemical waster per year in Section 6. A technique know as co-disposal was employed. This consisted of excavating trenches, filling the unlined trenches with general refuse, compacting the refuse, dumping in liquid wastes and covering the trenches.

ASARCO SMELTER, MT (FIGURE 6):

Measurements of soils in the East Helena area (population 3-5,000 people) around the ASARCO Smelter show high lead in excess of 1,000 ppm.

Analyses performed in 1975 indicated that children in East Helena also had elevated lead levels. In the Spring of 1983, the Centers for Disease Control, Atlanta, Georgia, is expected to conduct a survey of lead levels in 1-5-year-old children in the area of the lead smelter. EPA Region 8 is negotiating with ASARCO to determine the impact of their smelter on area soil, and surface and groundwater.

III. FEDERAL FACILITIES

A. ROCKY MOUNTAIN ARSENAL, CO (FIGURE 3):

Manufacturing activities at the Rocky Mountain Arsenal (RMA) near Denver, Colorado, have resulted in contamination of groundwater. This was first noted in 1954, when farmers north of the arsenal complained of crop damage following irrigation with groundwater pumped from the shallow aquifer. Some stock and irrigation wells were abandoned because of high salinity, and compensation was paid to a few landowners for crop damage. Evidence suggests that the high salinity resulted from water migration from an unlined pond at the arsenal used in Army manufacturing activities.

In 1974, organic compounds were detected in groundwater crossing the northern arsenal boundary. The subsequent detection of di-isopropyl methyl phosphonate (DIMP) and dicyclopentadiene (DCPD), a precursor used in pesticide manufacturing, in wells north of the arsenal prompted the Colorado Department of Health to issue a Cease and Desist Order in April 1975, to the Army and Shell Chemical Company which leases buildings on the arsenal. The order required an immediate stop to off-post surface and subsurface discharge of DIMP and DCPD, preparation of a plan to prevent future discharge of these pollutants and implementation of a water quality monitoring program to demonstrate compliance with the first two requirements. DIMP resulted from the Army manufacturing activities and DCPC from Shell manufacturing activities.

In May 1980, contamination of groundwater off-post northwest of the arsenal was detected. Dibromochloropropane (DBCP), a pesticide manufactured by Shell, first detected north of the arsenal in 1978, was detected in potable water sources. The chemical has been reported to cause male sterility and is a potential carcinogen, but a drinking water standard has not yet been established for this chemical. In May 1982, DBCP was detected at extremely low levels in a community drinking water well in Irondale. Though these levels do not present a health risk, CDH initiated a monitoring program and developed a plan to be implemented if a health hazard develops.

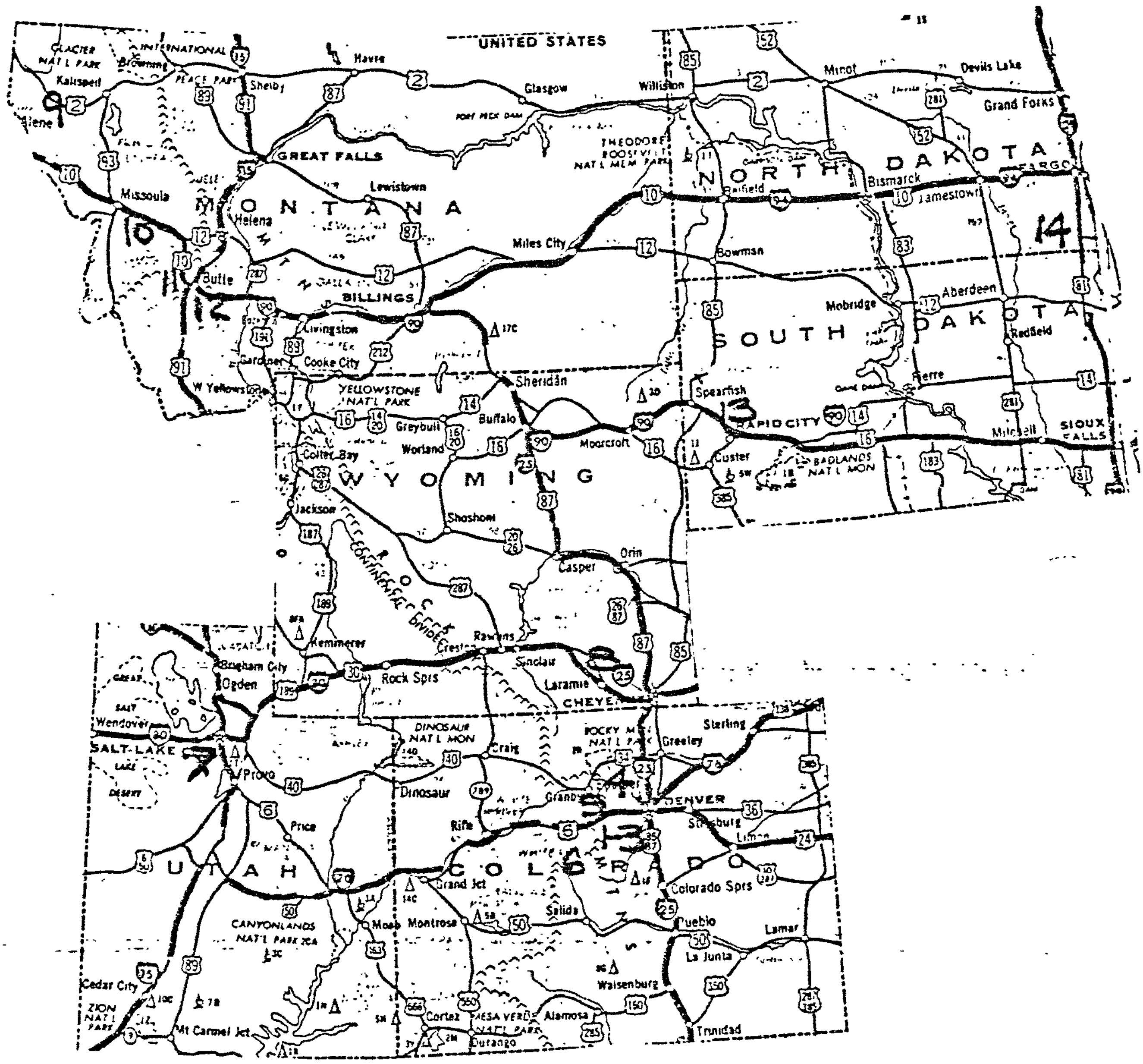
The Army has undertaken a containment remedy at the northern arsenal boundary. A treatment system was constructed to intercept and remove organic pollutants from groundwater egressing from the arsenal. After demonstrating the feasibility of this system, the Army constructed an extension to intercept other contaminated groundwater moving across the northern arsenal boundary. It started operation in September 1981. Shell has begun constructing a treatment system to intercept and treat DBCP-contaminated water migrating off-post to the northwest (Irondale area). It began operation in December 1981.

On December 6, 1982, the Army, the Colorado Department of Health, EPA, and Shell signed a Memorandum of Agreement (MOA). It provides the procedures for the four parties to interact as the arsenal contamination problem is mitigated.

B. LEADVILLE TUNNEL, CO (FIGURE 2):

The Leadville Drainage Tunnel discharges acid mine water into the Arkansas River a few miles upstream from California Gulch, a site listed on the NPL. The Leadville Tunnel is owned by the Bureau of Reclamation, therefore, it was not listed on the NPL. The proximity of the Leadville Tunnel and California Gulch, however, will require the Region to address them jointly in developing a remedy to the gold mine drainage problems at Leadville, Colorado. The tunnel, as with California Gulch, discharges a variety of metals into the Arkansas River (e.g., cadmium, zinc). The tunnel's discharge contains lower levels of these metals than the California Gulch discharge.

FIGURE 1


UNITED STATES
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NORTH DAKOTA
SOUTH DAKOTA
UTAH
COLORADO
GREAT FALLS
BILLINGS
Missoula
Helena
Butte
Havre
Shelby
Glasgow
Williston
Lewistown
Miles City
Livingston
Cooke City
Sheridan
Buffalo
Greybull
Worland
Moorcroft
Jackson
Shoshoni
Casper
Orin
Rawlins
Rock Sprs
Laramie
Minot
Devils Lake
Grand Forks
Bismarck
Jamestown
Bowman
Mobridge
Aberdeen
Redfield
Pierre
Spearfish
RAPID CITY
Custer
SIOUX FALLS
Mitchell
Ogden
Provo
SALT LAKE
Wendover
Price
Grand Jct
Moab
Montrose
Cortez
Durango
Alamosa
Salida
Pueblo
La Junta
Lamar
Trinidad
Walsenburg
Colorado Sprs
DENVER
Greeley
Sterling
Craig
Rifle
Dinosaur
Cedar City
Mt Carmel Jct
9
10
11
12
13
14
7
8
5
4

FIGURE 2

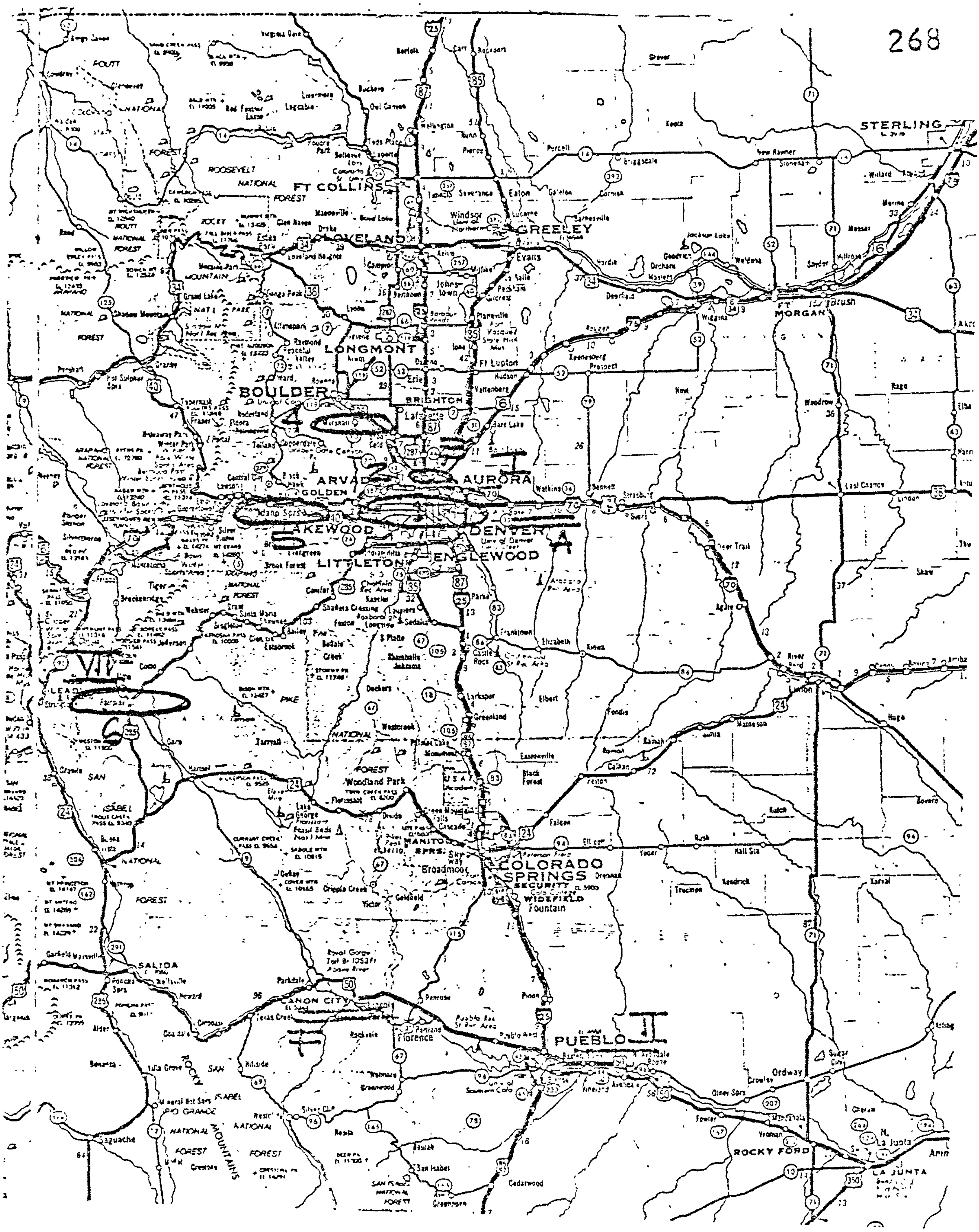
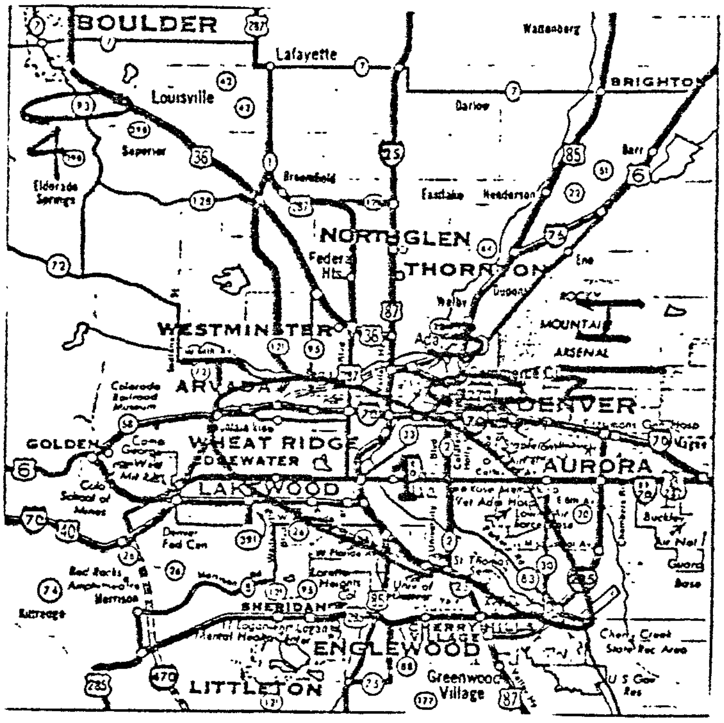
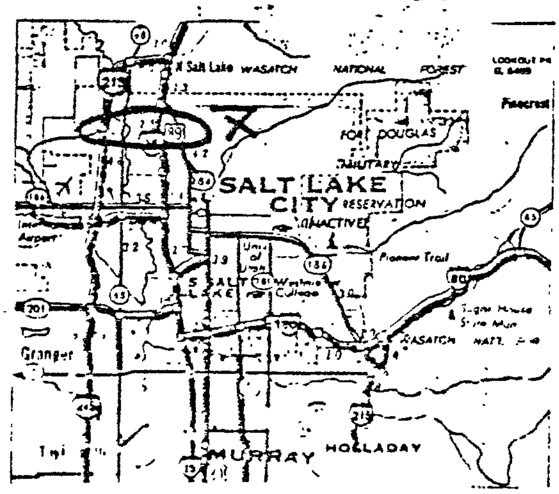

STERLING
FT COLLINS
LOVELAND
GREELEY
LONGMONT
BOULDER
BRIGHTON
ARVADA
AURORA
GOLDEN
LAKEWOOD
DENVER
LITTLETON
ENGLEWOOD
FT MORGAN
Brush
Woodland Park
MANITOU SPRS.
Broadmoor
COLORADO SPRINGS
SECURITY
WIDEFIELD
Fountain
SALIDA
CANON CITY
Florence
PUEBLO
ROCKY FORD
LA JUNTA
ROOSEVELT NATIONAL FOREST
SAN ISABEL NATIONAL FOREST
PIKE NATIONAL FOREST
RIO GRANDE NATIONAL FOREST
ROCKY MOUNTAINS

FIGURE 3


BOULDER
Lafayette
Louisville
BRIGHTON
NORTHGLEN
THORNTON
WESTMINSTER
ARVADA
DENVER
WHEAT RIDGE
EDGEWATER
GOLDEN
LAKEWOOD
AURORA
SHERIDAN
ENGLEWOOD
LITTLETON
Greenwood Village

A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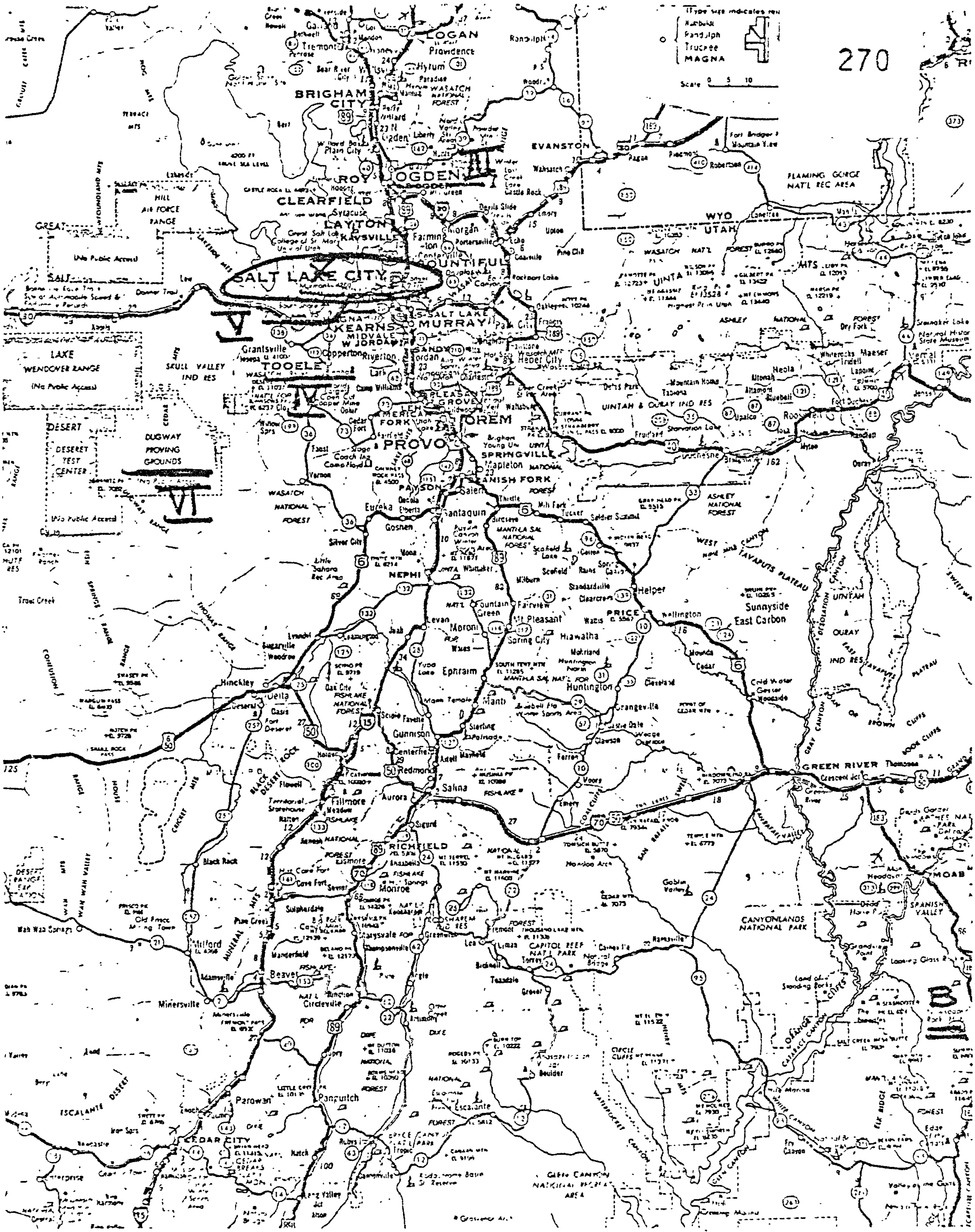
CITY
FORT DOUGLAS
Granger
MURRAY
HOLLADAY

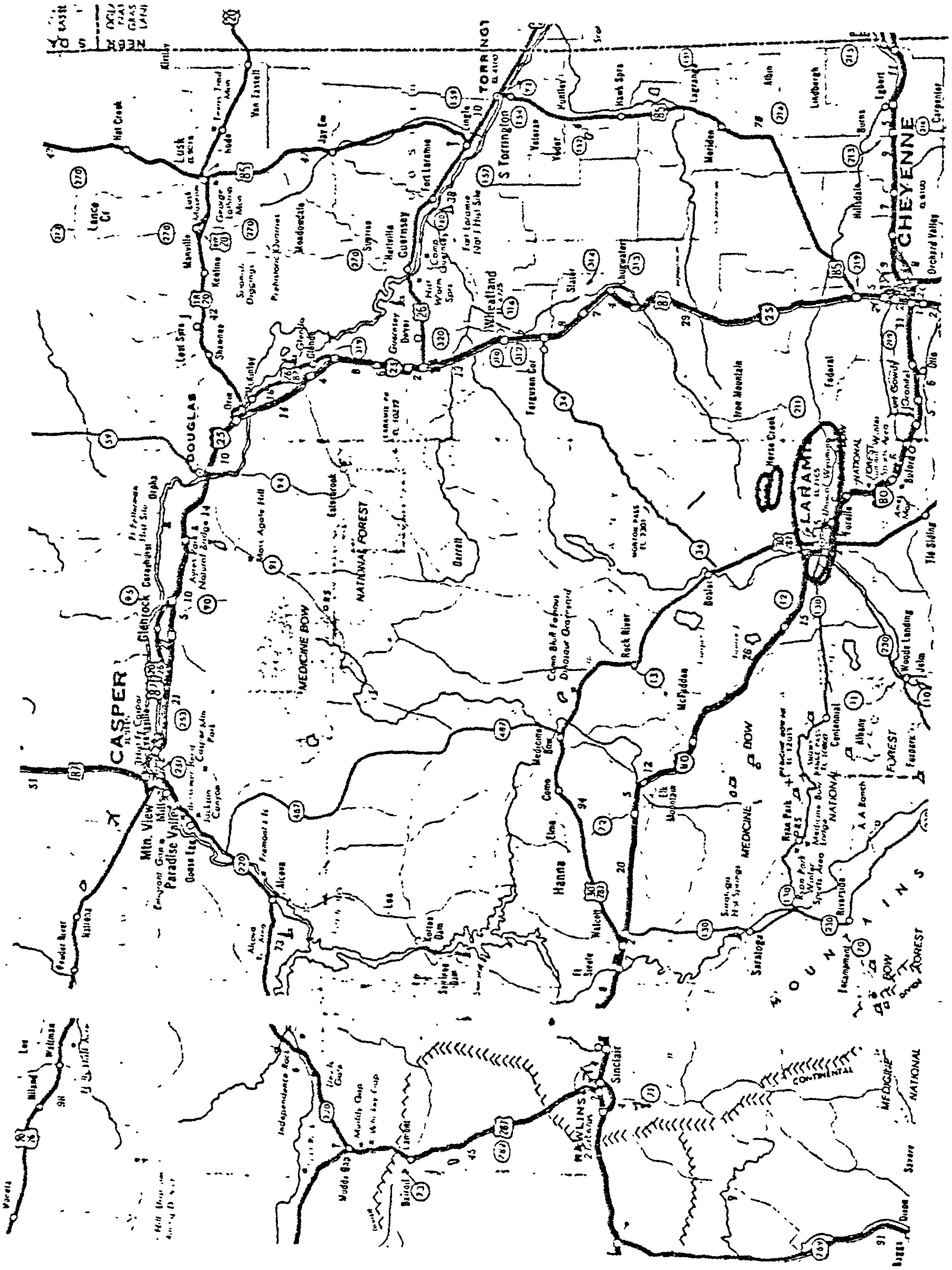
B

FIGURE 4



270
LOGAN
Providence
BRIGHAM CITY
OGDEN
ROY
CLEARFIELD
LAYTON
KAYSVILLE
BOUNTIFUL
SALT LAKE CITY
EVANSTON
S SALT LAKE
MURRAY
KEARNS
MIDVALE
W JORDAN
TOOELE
Grantsville
SANDY
PLEASANT GROVE
AMERICAN FORK
OREM
PROVO
SPRINGVILLE
Mapleton
SPANISH FORK
PAYSON
Santaquin
Heber City
Park City
WYO
UTAH
FLAMING GORGE NAT'L REC AREA
UINTA
ASHLEY NATIONAL FOREST
UINTAH & OURAY IND RES
DUGWAY PROVING GROUNDS
DESERET TEST CENTER
WENDOVER RANGE
SKULL VALLEY IND RES
Eureka
NEPHI
Helper
PRICE
Wellington
Sunnyside
East Carbon
Levan
Moroni
Fairview
Mt Pleasant
Spring City
Ephraim
Manti
Huntington
Hiawatha
Orangeville
Delta
Hinckley
Gunnison
Salina
Fillmore
Aurora
RICHFIELD
Monroe
Elsinore
GREEN RIVER
MOAB
CANYONLANDS NATIONAL PARK
CAPITOL REEF NAT'L PARK
Milford
Beaver
Minersville
Circleville
Parowan
Panguitch
CEDAR CITY
Escalante
Roosevelt
Duchesne
Vernal
Fort Duchesne
Jensen
V
VI
B

FIGURE 5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DOUGLAS
CHEYENNE
LARAMIE
Glenrock
Lusk
Guernsey
Wheatland
Rock River
Medicine Bow
Hanna
Saratoga
Sinclair
MEDICINE BOW
NATIONAL FOREST

FIGURE 6

272

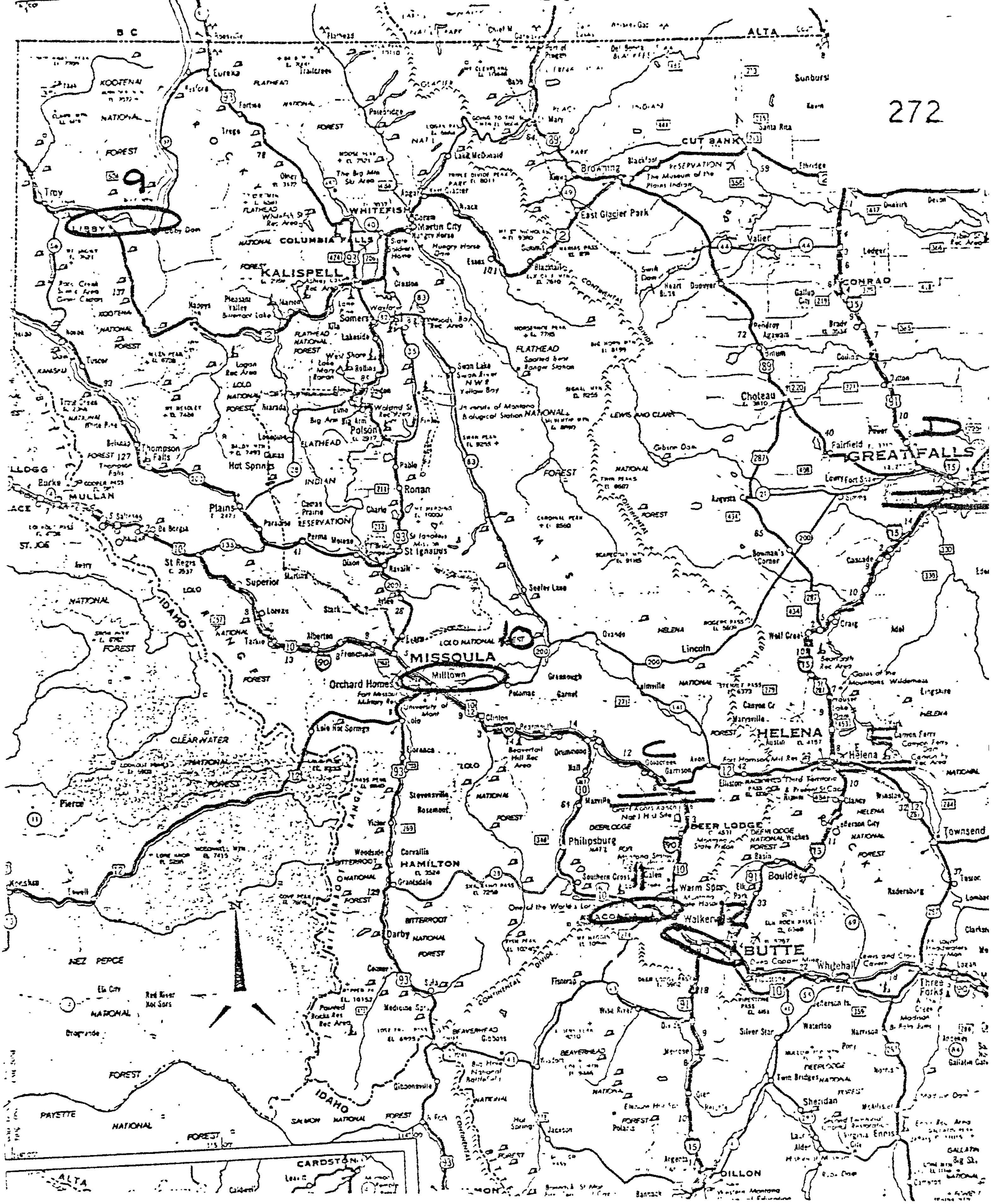
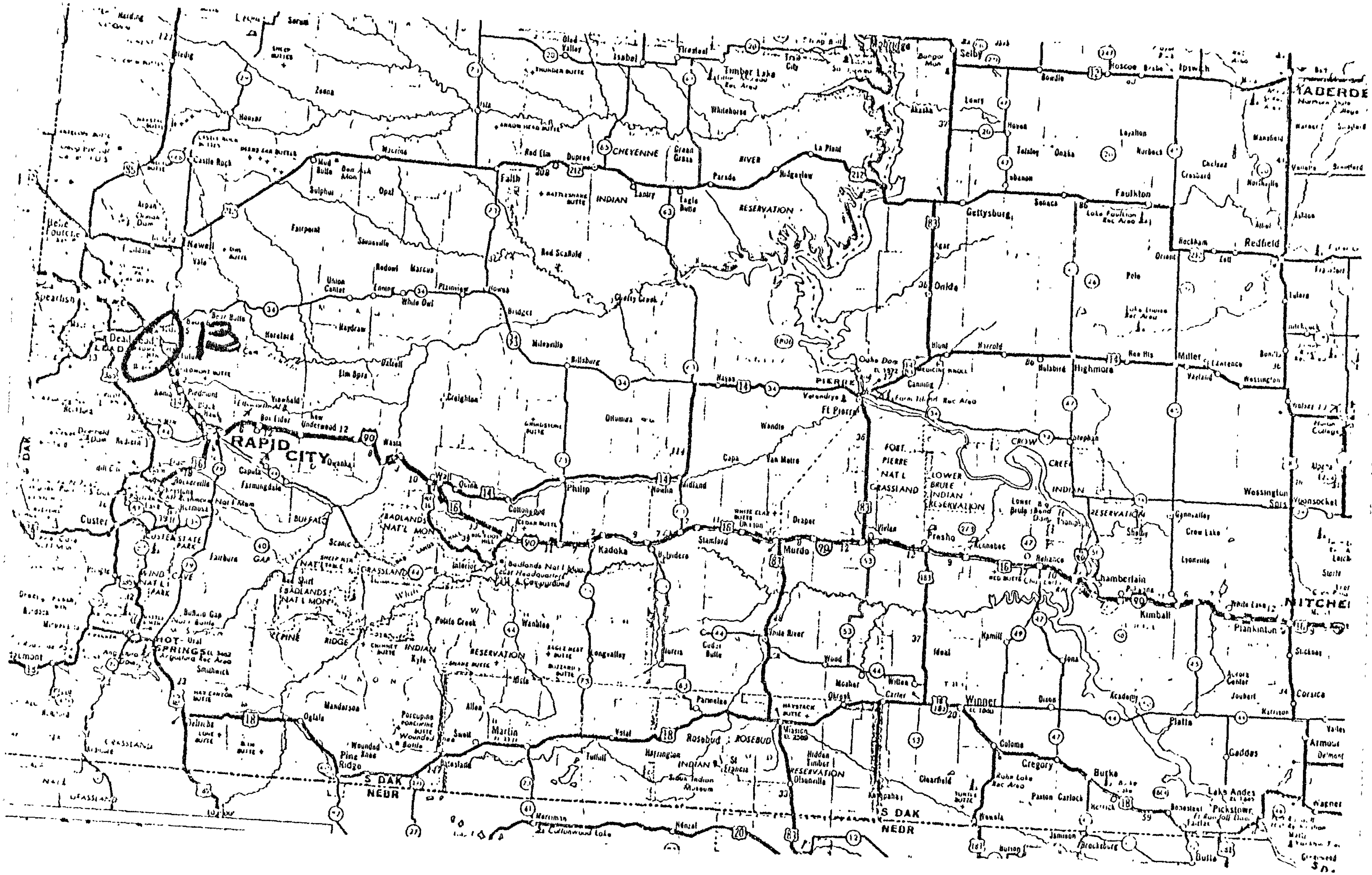

B C
ALTA
Eureka
Troy
KOOTENAI NATIONAL FOREST
LIBBY
9
WHITEFISH
Martin City
COLUMBIA FALLS
KALISPELL
Browning
CUT BANK
Sunburst
East Glacier Park
Valier
CONRAD
Somers
Polson
Ronan
Choteau
Fairfield
GREAT FALLS
D
Thompson Falls
Hot Springs
Plains
MULLAN
St Regis
Superior
St Ignatius
Seeley Lake
Augusta
Cascade
Lincoln
Craig
10
MISSOULA
Milltown
Orchard Homes
Lolo
Clinton
Drummond
Garrison
Avon
C
HELENA
CLEARWATER NATIONAL FOREST
IDAHO
Stevensville
Corvallis
HAMILTON
Philipsburg
DEER LODGE
Townsend
Boulder
Darby
BUTTE
Whitehall
Three Forks
NEZ PERCE
Sheridan
PAYETTE NATIONAL FOREST
SALMON NATIONAL FOREST
DILLON
CARDSTON

FIGURE 7

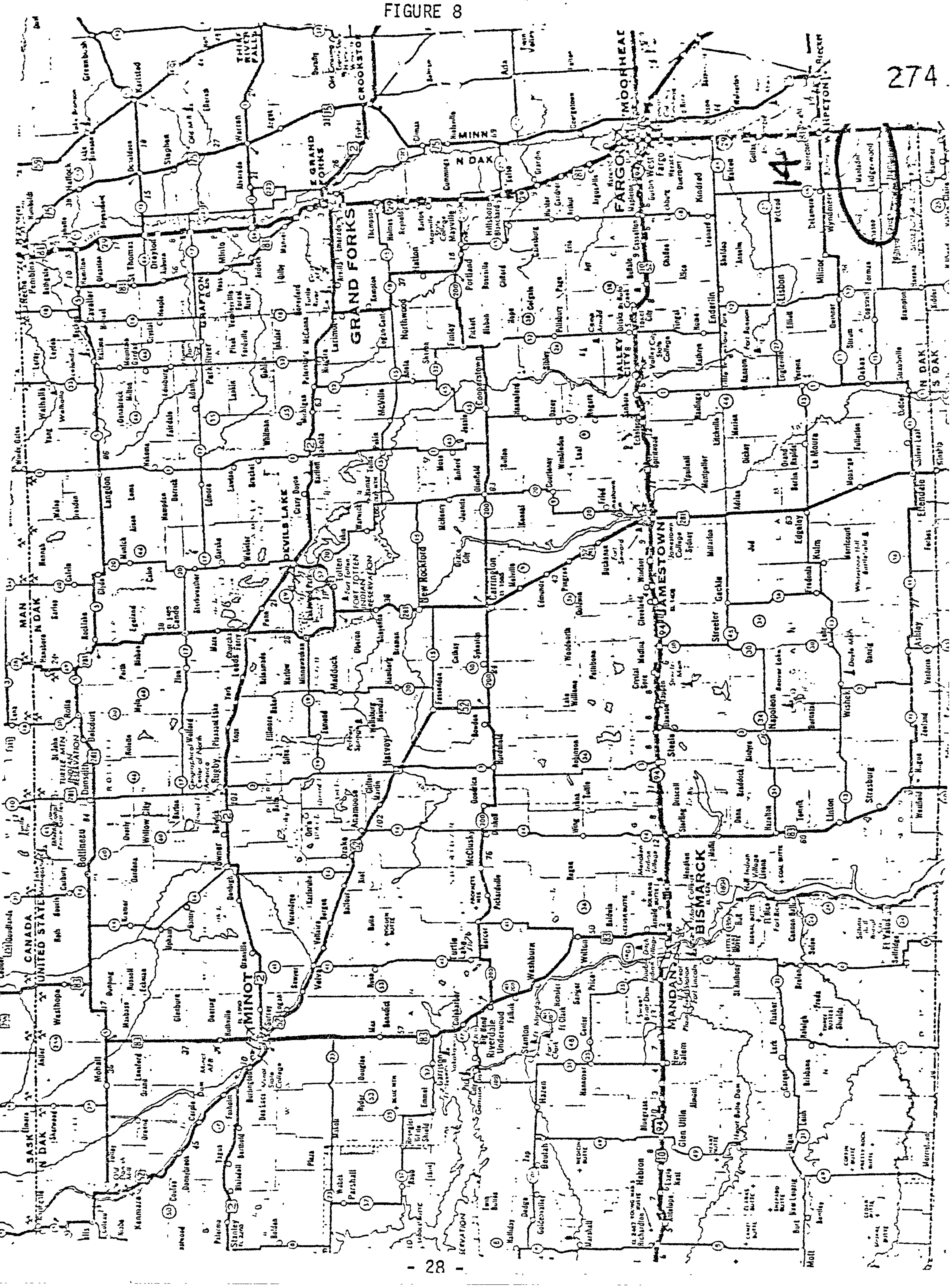


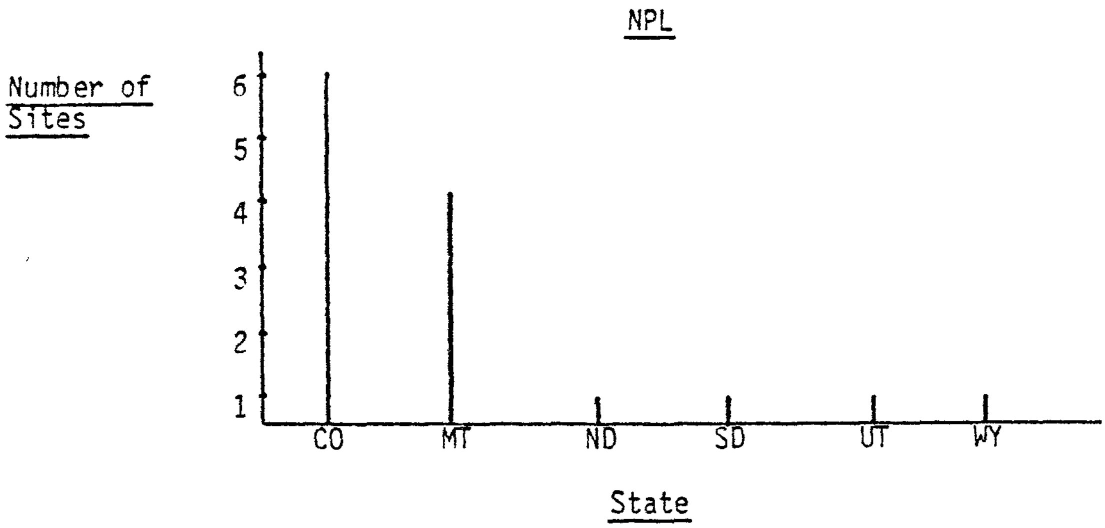
RAPID CITY
PIERRE
Ft Pierre
Spearfish
Custer
Newell
Vale
Castle Rock
Faith
Dupree
CHEYENNE
INDIAN
RESERVATION
RIVER
Timber Lake
Isabel
Gettysburg
Faulkton
Redfield
Ipswich
Selby
Onida
Highmore
Miller
Wall
Philip
Kadoka
Murdo
Presho
Kimball
Chamberlain
Plankinton
Winner
Gregory
Burke
Platte
Corsica
Lake Andes
Pickstown
Martin
Pine Ridge
Mission
Rosebud
BADLANDS NAT'L MON
CROW CREEK
LOWER BRULE INDIAN RESERVATION
FORT PIERRE NAT'L GRASSLAND
S DAK
NEBR
Wessington Spgs
Woonsocket
Midland
Kennebec
Belle Fourche
Union Center
Hot Springs
Wind Cave Nat'l Park
Custer State Park

273

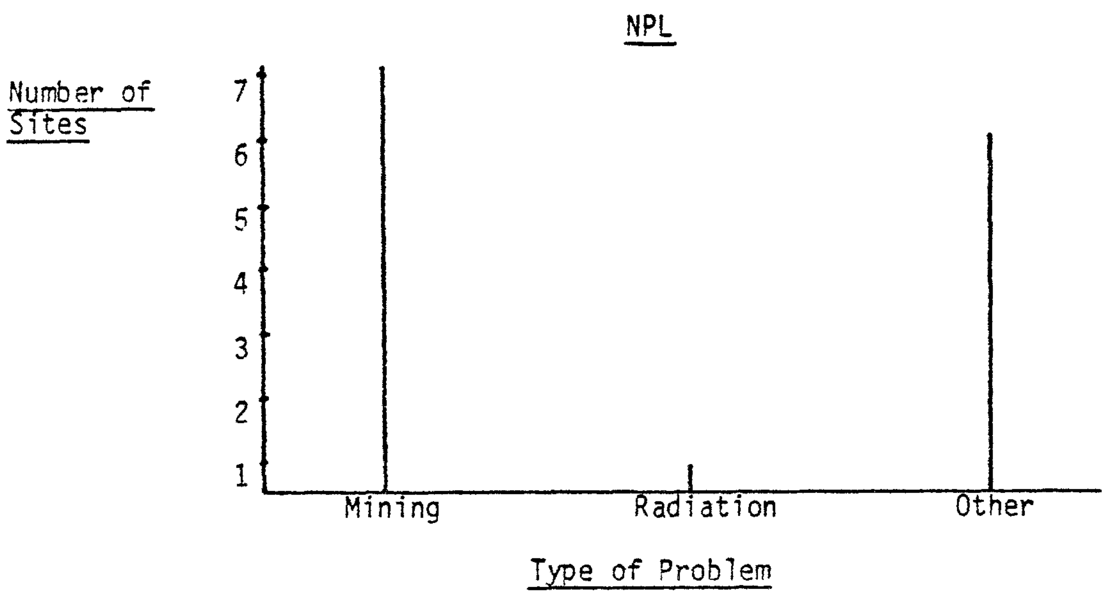
FIGURE 8

274

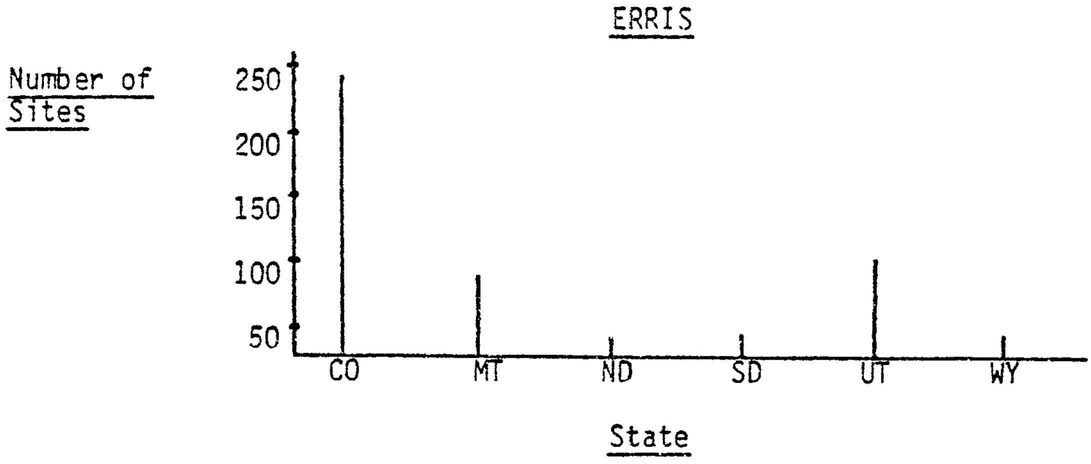

GRAND FORKS
DEVILS LAKE
JAMESTOWN
BISMARCK
MANDAN
MINOT
FARGO
VALLEY CITY
MOORHEAD
CROOKSTON
CANADA
UNITED STATES
N DAK
S DAK
MINN
Carrington
Rugby
New Rockford
Cooperstown
Washburn
Langdon
Grafton
Lisbon
Wahpeton
Towner
Harvey
Bottineau
Mohall
Kenmare
Stanley
Napoleon
Linton
Steele
Dickey
Oakes
Hillsboro
Mayville
Fort Totten
Fort Totten Indian Reservation
Turtle Mtn Indian Reservation



(GRAPH 1)



(GRAPH 2)



(GRAPH 3)

NPL, High Priority, Federal Sites

Matrix

Site Name	Groundwater	Surface Water	Air	Direct Contact	Fire & Explosion
Denver Radium Site			x	x	
Woodbury Chemical Co.	x	x		x	
Sand Creek Industrial Site	x	x		x	x
Marshall Landfill	x	x			
Central City-Idaho Springs Mining District					
California Gulch	x	x			
Rose Park	x			x	
Union Pacific/ J. H. Baxter	x	x	x	x	
Libby Groundwater	x	x			
Milltown Reservoir Sediment	x	x			
Anaconda Smelter	x	x	x		
Silver Bow Creek	x	x		x	
Whitewood Creek	x	x		x	
Arsenic Trioxide Site	x				
Lowry Landfill	x				
Canon City (Lincoln Park)	x				
Monticello Properties			x	x	
Rocky Mountain Phosphate	x	x	x		x
Anaconda (Great Falls)	x	x	x		
ASARCO Smelter	x	x	x		
Rocky Mountain Arsenal	x	x			

Type of Hazard

(GRAPH 4)

NPL

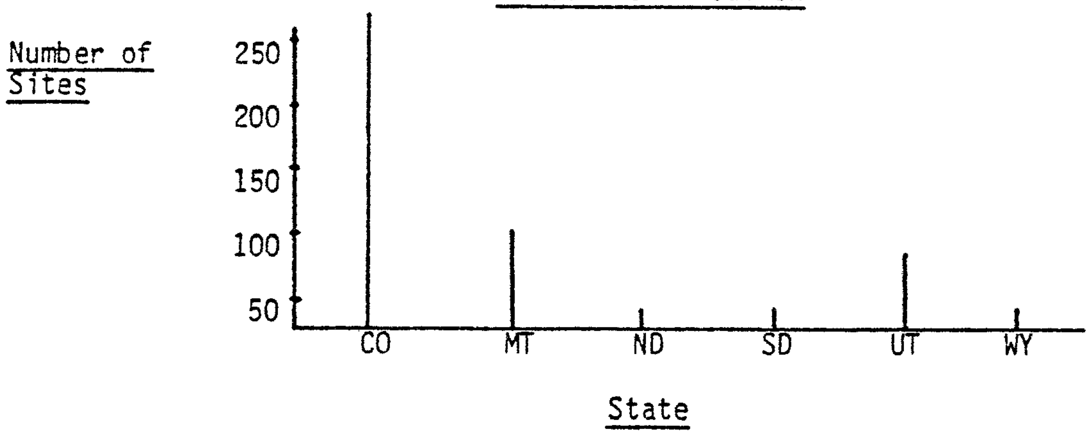
Status

Site Name	Remedial Investigation	Feasibility Study	Design	Remedial Action
Denver Radium Site	3	3		
Woodbury Chemical Co.	3	3		
Sand Creek Industrial Site	6			
Marshall Landfill	6	6	6	6
Central City-Idaho Springs Mining District	3	3		
California Gulch	6			
Rose Park	1	1	5	5
Union Pacific/ J. H. Baxter	2	2		
Libby Groundwater	6	6		
Milltown Reservoir Sediment	3	3		
Anaconda Smelter	5-6			
Silver Bow Creek	3	3		
Whitewood Creek	5			
Arsenic Trioxide Site	3			

(GRAPH 5)

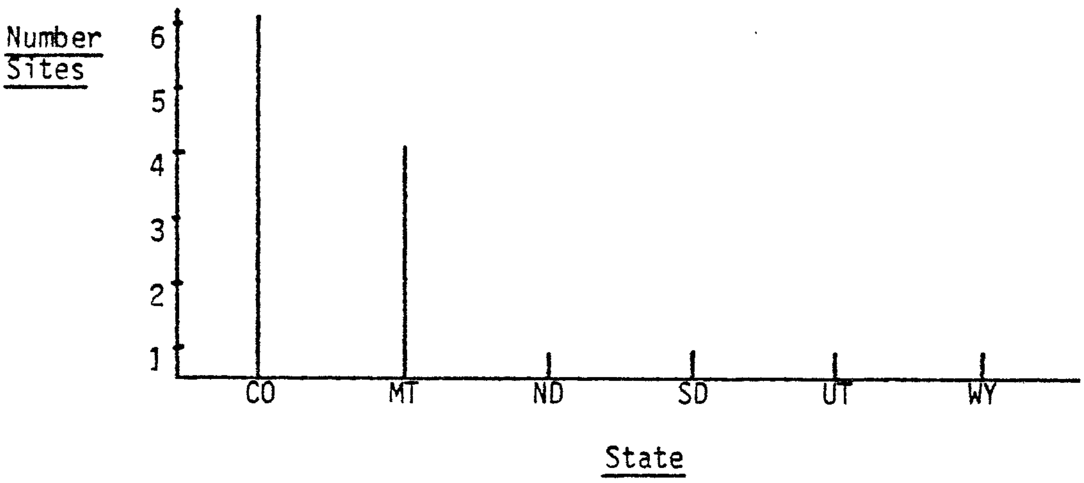
Key:
1) EPA
2) State Only
3) Cooperative Agreement
4) State Contract
5) Voluntary Agreement
6) Compliance Agreement

103(c) Notification



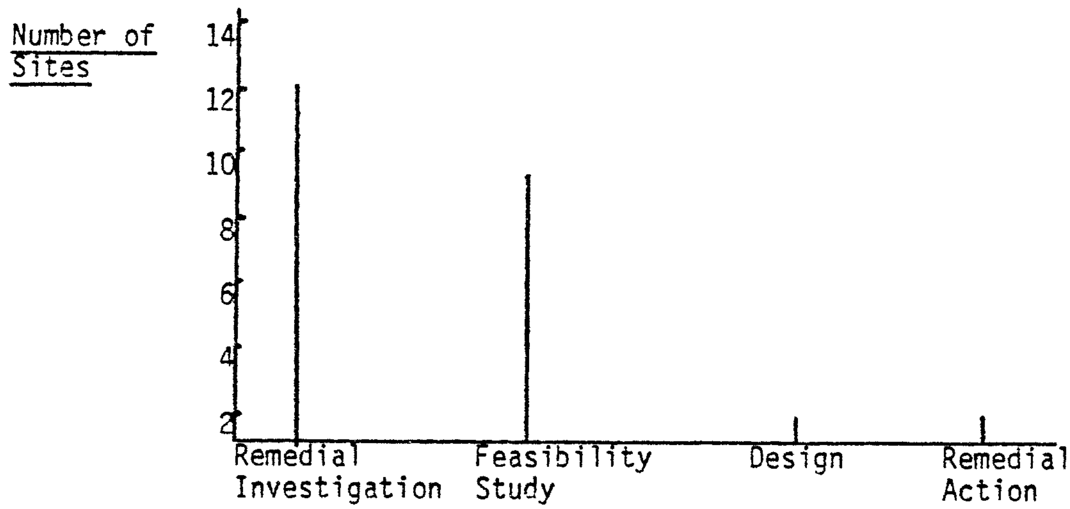
(GRAPH 6)

NPL



(GRAPH 7)

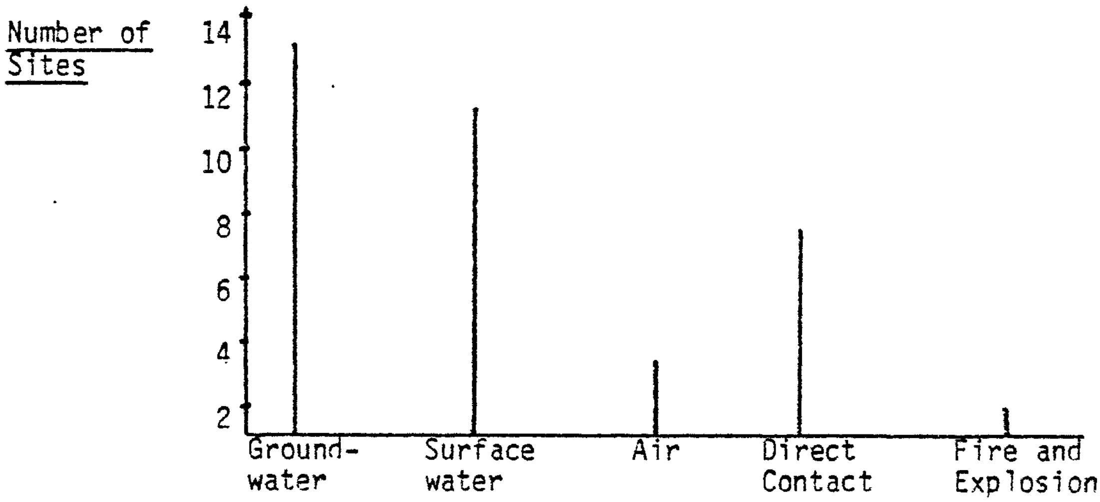
NPL



Action at Sites

(GRAPH 8)

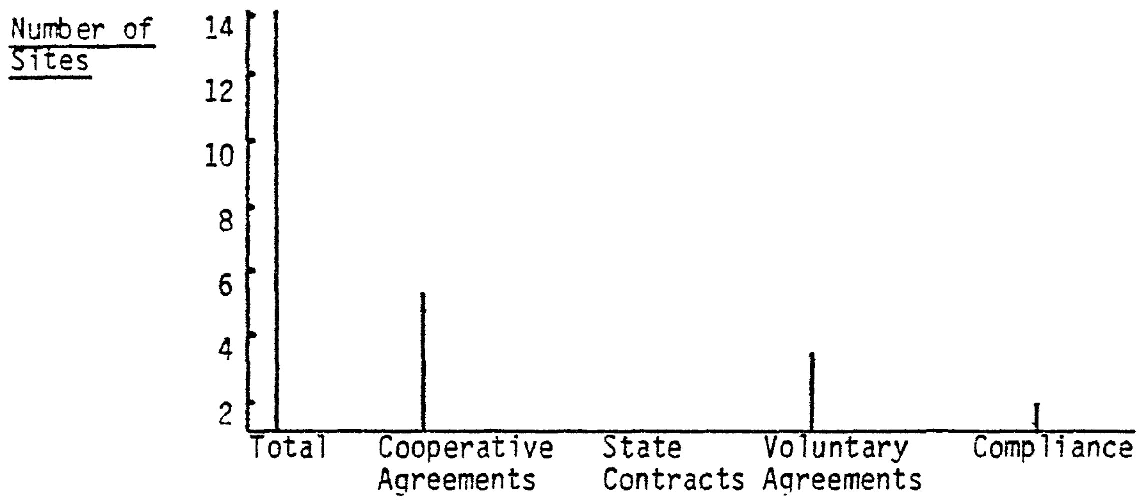
NPL



Type of Hazard

(GRAPH 9)

NPL


Number of Sites
14
12
10
8
6
4
2
Total
Cooperative Agreements
State Contracts
Voluntary Agreements
Compliance

(GRAPH 10)

VI.

RCRA Section
Hazardous Waste - (Active Sites)
Environmental Management Report

EPA REGION VIII
ENVIRONMENTAL MANAGEMENT REPORT

HAZARDOUS WASTE - ACTIVE SITES (RCRA)

PART 1: OVERVIEW OF STATUS AND TRENDS

Most of the information which we have on the environmental problems posed by active hazardous waste handlers dates from November 19, 1980, the start of the regulatory program developed under the Resource Conservation and Recovery Act (RCRA). Since that time, EPA has moved a long way toward defining, analyzing and correcting those problems, but much work remains to be done in all three areas. This section will briefly summarize and display general background data in order to provide an overview of the status and trends of hazardous waste management and mismanagement in Region VIII.

Identification of Waste Handlers

The identification of the number and type of hazardous waste generators, transporters, and treatment, storage and disposal (TSD) facilities was made possible by the requirement that EPA be notified by those engaged in each type of activity. The chart in Attachment A-1 displays the resulting figures, and distribution by State, as gathered from the Hazardous Waste Data Management System (HWDMS), the RCRA data base.

One of the salient facts emerging from the notification figures is that over half of the total of 2521 notifiers have withdrawn from the regulatory program, due to one of the indicated exemptions or special requirements. The significance of and problems associated with mining waste and recycling exemptions will be discussed below. Another related fact is that over half of the total TSD Part A permit applications filed in the Region (over 300) have been withdrawn. Aside from the large number of protective filings, this has been due in large part to the above-mentioned exemptions. It also stems from a tendency to store waste for less than 90 days, and thereby obviate the need for the permit (discussed below).

Universe of Hazardous Wastes

The main types and sources of hazardous waste generated and handled in Region VIII are:

- electroplating bath solutions and sludges - high-tech industry;
- industrial solvents - various manufacturing processes;
- petroleum refinery wastes - oil refineries;
- pesticides - production by-products and discarded off-spec products;
- wood preservation wastes - tie and pole treatment plants;
- corrosive wastes - metal treaters, paint strippers;
- EP toxic wastes - coke and steel industry, used oils, paint production;
- ignitables - solvents, paint thinners, chemicals;
- reactive - gas plants, explosives manufacturers.

In order to better describe the universe of wastes in the Region, we intend to develop a chart showing the frequency distribution of the most common types of waste.

The volume and disposition of each waste type cannot be reported because EPA Headquarters did not make the modifications to the RCRA data base which were necessary for the 1981 Annual Report data to be entered and tabulated. If the data base is modified in time for the 1983 Annual Report (due in March 1984), this highly important and useful information will be available to decision makers in the government, private and public sectors.

Treatment, Storage and Disposal (TSD) Facilities

Among the various Region VIII hazardous waste TSD facilities are examples of each general handling method, with the exception of ocean disposal. The chart in Attachment A-2 shows the number and distribution of the types of TSD facilities across the six states. The same basic information is presented in a 'barrel-graph' format in Attachment A-3. It is instructive to note that contrary to most Regions, the number of disposal and incineration facilities is noticeably greater than that of simple treatment and storage facilities. It is the disposal facilities which present the greatest existing and potential threats to groundwater (see Part 2).

Commercial Disposal Facilities

The map in Attachment A-4 shows the location of the facilities in the Region whose primary business is the disposal of hazardous waste received from off-site. They are:

- U.S. Pollution Control, Grassy Mountain Facility - Clive, UT
- Jim's Water Service - Gillette, WY
- Big Dipper Enterprises - Gwinner, ND
- Denver-Arapahoe Chemical Waste Processing Facility - Aurora, CO
- Highway 36 Land Development Corporation - Last Chance, CO

Since the sites in Colorado and North Dakota cannot presently operate, and the site in Wyoming only handles certain oil industry wastes, the current commercial disposal capacity in the Region is clearly quite limited (see Trends, below).

Commercial Recycling Facilities

The map in Attachment A-5 displays the location of the following commercial hazardous waste recycling facilities:

- AERR Co. - Arvada, CO
- Mountain Chemicals, Inc. - Golden, CO
- Oil & Solvent Process Co. - Henderson, CO
- Thoro Products Co. - Golden, CO
- Ekotek - Salt Lake City, UT
- Williams Strategic Metals - Laramie, WY

The number of active recycling facilities exceeds that of disposal sites, but only a few types of wastes (such as solvents, oils and some metals) are recycled, and recyclers present their own set of problems (see Part 2).

Hazardous Waste on Indian Reservations

The 27 Indian reservations within Region VIII constitute a large land area and socio-economic context with a real potential for serious hazardous waste problems. Most of our work has been on solid (non-hazardous) waste matters, but the two spheres naturally overlap. Since our recent inventory indicated that only one out of over 100 solid waste disposal sites an Indian reservations qualify as a sanitary landfill, the danger from misuse of hazardous wastes is great. The current number of active hazardous waste handlers on Indian reservations is small: a TSD facility at a munitions test plant in Skull Valley, Utah (Hercules Tekoi), a small quantity generator (formerly a storage facility) on the Ft. Berthold Reservation, North Dakota (Northrop Electronics), and a transporter (Hidatco, Inc.) working out of the Ft. Berthold Reservation. But increasing energy resource development and economic pressures for new, isolated hazardous waste sites, make Indian reservations prime targets for problems. In order to correct and avoid such problems, we are providing solid waste assistance and training to some reservations, including four for hazardous waste in particular, in FY 1984. More funding and support for such efforts is needed if we are to meet the challenge.

Correction of Unsafe and Improper Handling Practices

EPA and the States in Region VIII have conducted over 1800 RCRA compliance inspections and 57 probable cause inspections (e.g., citizen complaints, 'midnight dumping' incidents). Improved handling practices have come from both in-field inspector recommendations and formal enforcement actions. Through December of 1982, we have taken the following number and types of enforcement actions (including warning letters, complaints and final orders): 46 for improper treatment, storage or disposal practices, 100 for inadequate plans or records, 12 for discrepancies or non-use of shipping manifests, and 72 for lack of, or unacceptable, financial assurance or insurance instruments. (In tabulating these figures, each violation found (and corresponding correction made) has been counted just once, even if achieving compliance required more than one step in the enforcement process.)

Improvement of Facilities Through Permitting

Another mechanism used for improving and safeguarding the environment in regard to hazardous waste is that of RCRA permit issuance for treatment, storage and disposal facilities. We have requested Part B permit applications from 49 facilities thus far, and will continue to do so at the rate of approximately three per month. In making our Part B requests, we have focused on those sites where complying with the final (Part 264) permit standards will result in significant improvements. In October of 1981, Region VIII issued the first RCRA permit in the nation to the Oil and Solvent Process Company, a recycling facility near Denver, Colorado. It is important to issue permits for new facilities such as this in order to increase the commercial hazardous waste treatment, storage and disposal capacity in the Region (as discussed below).

Trends

In the short period that EPA has regulated active hazardous waste handlers, certain trends have begun to emerge, some negative and some positive from the standpoint of the environment. On the negative side, perhaps the major emerging problem in Region VIII is the lack of commercial disposal capacity. For various reasons, including State siting laws (which give counties the power to veto the establishment of new facilities), as well as a legacy of a dearth of adequate facilities, the number of commercial disposal sites within the Region is much below current demand. We cannot determine the size of the gap between waste generation and disposal capacity until and unless the Annual Report data is computerized (as discussed above). The impacts of this gap include higher costs for waste shipments out of state and out of Region, more likelihood of 'midnight dumping', and more risk of accidents during long distance shipments. It should also be pointed out that there are no commercial incineration facilities in Region VIII.

Another, related trend, which has not quite been felt yet, is the 'weeding out' of poorly run facilities. Certain facilities, especially the older recyclers (see Attachment A-8), may not be able to come into compliance with the new standards for waste management under RCRA. While the closing down of such operations can be considered an improvement for the environment in one sense, it can also be seen as a further reduction in the available commercial waste management capacity in the Region.

A final negative trend which deserves mention is the tendency for storage permit applicants to reduce their storage period to less than 90 days, and thereby eliminate the need for the permit. Approximately 50 facilities in Region VIII have withdrawn their applications for this reason. There are at least two problems associated with this trend. First, waste must be shipped off-site more often, thus increasing the risks of transportation accidents and decreasing the economies of scale. And second, storing for less than 90 days places the facilities under the much less stringent generator requirements, which increases the possibility of mismanagement. One solution to this situation which has been suggested by EPA but not yet acted upon, is to have some kind of permit-by-rule for small or short-term storage facilities, with requirements which are stricter than that for generators but less burdensome than the full TSD requirments.

We can also point to a few positive trends. First, based upon our contacts with the regulated community, and judging from the number of withdrawals for this reason (134 total; see Attachment A-1), there has been an increase in the recycling of hazardous wastes. This is not surprising, given the rising costs for disposal. It also is not surprising that generators are changing their production processes so as to reduce the amount of waste generated. We do not have the data to demonstrate this because we have yet to receive Annual Reports for more than one year. Finally, there is a growing trend toward the installation of pretreatment units, which then discharge non-hazardous waste into publicly owned treatment works. Although this eliminates the need for storage and transportation of the wastes, it amplifies the need for an effective pretreatment program (see Part 2).

PART 2: SIGNIFICANT ENVIRONMENTAL PROBLEMS AT ACTIVE HAZARDOUS WASTE SITES

For the purposes of this report, we have designated certain environmental problems as especially 'significant'. The criteria for making that designation, and for ranking the problems in the order presented, are similar to the criteria we use for prioritizing Part B permit requests and selecting 'major' facilities. They include the following factors, which are not strictly rank-ordered:

- presence and extent of environmental or human health damage or danger
  - groundwater or surface water contamination
  - potential impact on public health

- type of waste
  - acutely hazardous, ignitable, toxic, reactive, etc.

- type of operation
  - handling method(s)
  - probability of mismanagement and risk

- size of operation
  - volume and variety of wastes handled
  - facility design capacity

- location
  - nearness to and size of population in area
  - surrounding land use
  - proximity to sensitive resources (e.g., surface or drinking water)

- compliance history
  - past or pending enforcement actions
  - types of violations.

Rather then attempting to list, rank and discuss all of the Region VIII hazardous waste handlers which may exhibit significant environmental problems based on the above criteria, we have chosen to present certain key, generic types of problems and then cite some of the most representative and important cases which illustrate those problems. All but the last of the problems discussed below are 'abatement' problems, which currently result in adverse environmental effects. However, they each may also be considered as 'potential degradation' problems, since the full extent of degradation is still being studied and determined. Toward that end, we identify those areas where additional monitoring or research is needed to understand the severity and cause of the problems.

The following significant environmental problems are discussed: groundwater contamination, oil refineries, recyclers, mining wastes, implementation of pretreatment standards, and a site-specific case (the Denver-Arapahoe Chemical Waste Processing Facility).

GROUNDWATER CONTAMINATION

Causes of the Problem

There are 73 hazardous waste management facilities in Region VIII which are required to conduct groundwater monitoring. (See the SI/Disposal column in the chart in Attachment A-2.) Many of them have exhibited serious groundwater contamination problems as a result of inadequate disposal practices. Ten companies have applied for groundwater monitoring waivers (per 40 CFR 265.90(c)), but a waiver was not deemed appropriate in any of those cases. To date, no facility has provided an adequate technical justification for receiving a waiver appproval. Attachment A-6 discusses four of the most significant groundwater problem sites in the Region.

Barriers to Solution

Facilities are obtaining groundwater monitoring data as required, but we have noted that some control wells upgradient of hazardous waste management areas are contaminated and therefore not useful. The groundwater parameters (265.92(b)(3)) may not provide adequate indicators of groundwater contamination. Presently, this concern cannot be addressed until the permit evaluation process begins.

Implications for Agency Management

Based on evidence of environmental contamination, several facilities are moving into the assessment phase (265.93). In general, more guidance, technical information and work is needed on many groundwater contamination and monitoring issues, including the waiver provision, well location and construction standards, and the designation of aquifers.

OIL REFINERIES

Causes of the Problem

Oil refineries constitute one of the major types of hazardous waste producing industries in Region VIII (see Attachment A-7). Nearly all of the oil refineries have land disposal or land treatment facilities which are impacting groundwater. Many refineries also have inactive Superfund sites from past practices. Disposal methods for toxic refinery wastes have tended to take advantage of wide open spaces instead of environmentally sound waste management techniques.

Barriers to Solution

Many refineries are trying to delist their wastes at the same time that those wastes are contaminating groundwater. Region VIII has taken the position that the delisting of refinery wastes should not be allowed until a chemical test is developed and promulgated that adequately addresses these types of wastes. The current extraction procedure toxicity test is not appropriate for oily wastes. Distinguishing old contamination from current contamination is also a real problem.

Implications for Agency Management

More time and resources need to be expended to gather data on groundwater pollution within the environs of refinery sites. We also need to do more studies on the organic constituents of refinery wastes in order to determine their toxicological significance. It may be advisable to revise the basis for the listing of refinery wastes to include organics. Also, the exemption for oil and gas production wastes (261.4(b)(5)) may merit reconsideration in conjunction with the above.

RECYCLERS

Causes of the Problem

Recyclers of industrial waste chemicals pose significant problems because of a lingering history of unsafe hazardous waste management practices. Unmarked drums leaking waste directly onto the ground have not been uncommon for these types of facilities. Older recycling facilities are often located in densely populated, high-risk areas. Recyclers handling flammable materials are of special concern because of the possibility for fires. Attachment A-8 lists some of the significant problem recyclers in the Region.

Barriers to Solution

Part of the problem is that, while trying to encourage recycling, the Agency has promulgated a complete exemption from regulation for certain recycled wastes. 40 CFR 261.6(a) allows for the generation, transportation, treatment and storage of characteristic (Subpart C) wastes, prior to recycling, without any regulation. Consequently, many hazardous wastes intended for recycling are not managed according to safe handling or engineering practices. Some facilities have taken the attitude that this exempts them from any and all requirements under RCRA, and intense litigation is often necessary to bring them into compliance with those regulations which do apply.

Alternatively, 40 CFR 261.6(b) provides more stringent control for listed (Subpart D) wastes destined for recycling. The wastes must be manifested and the receiving facility must be permitted or have interim status to receive and treat the waste. These two different requirements relating to recycling of waste have caused considerable confusion. There are very little chemical or toxicological differences between the non-regulated characteristic wastes and the regulated listed wastes, but the regulations, and therefore handling methods, differ widely.

Implications for Agency Management

The current RCRA regulations definitely encourage recycling of certain wastes, but they also sacrifice a great deal of needed environmental protection. When and if the regulatory changes proposed on April 4, 1983 become final, they will help to clarify handling requirements and impose more consistent control over recyclers, while still encouraging recycling. These regulations also address long term storage of hazardous wastes and require facilities to process the wastes within a set time period. Currently, a facility can state that it intends to recycle a waste, but not get around to it for years, if ever. In order to enhance resource conservation and recovery, more work on the technical and regulatory aspects of hazardous waste recycling needs to be done.

MINING WASTES

Causes of the Problem

Mining wastes pose a significant environmental concern in Region VIII because of their volume and the likely possibility of surface and groundwater contamination. This contamination can result from the disposal of mine waste material using common, least-cost methods.

Barriers to Solution

Since the passage of the Solid Waste Disposal Act Amendment of 1980, the mining exemption has been a source of controversy in Region VIII. There is general agreement that waste chemical products (such as pesticides) listed in 40 CFR 261.33(e) and solvents used at mines must be managed as regulated hazardous wastes, because they are not unique to the mining industry. There are several instances, however, of disagreement on the extent of other aspects of this exemption. The Region VIII position is that only mill tailings, waste rock or other wastes generated in the mining process are exempted. We have regarded hazardous wastes generated from secondary processes, such as upgrading the mined ore, as covered by RCRA. Kennecott Copper in Utah has contested our position on this matter and has gone to EPA Headquarters for clarification. Headquarters has initially upheld our position on a specific electrotwinning process involved in Kennecott's operation, but the matter is under further review.

Implications for Agency Management

The regulation of mining wastes needs clarification by EPA. Headquarters has conducted sampling of certain mining wastes to determine the extent of the environmental problems involved. It would be useful for the Regions to see a synopsis of the data and conclusions. Industry has asked questions about the study which we could not discuss. We should also be involved in the next stages of evaluation and policy-making.

IMPLEMENTATION OF PRETREATMENT STANDARDS

Causes of the Problem

The RCRA hazardous waste regulations were issued with a reliance on the implementation of an effective pretreatment program to prevent improper disposal of hazardous wastes into public owned treatment works (POTWs). The existing RCRA regulations exempt wastes which are discharged in conjunction with domestic sewage (40 CFR 261.4(a)(1)(ii)). In the absence of a fully enforced pretreatment program, some hazardous waste generators are using this as a means to avoid proper handling of their wastes.

Barriers to Solution

The pretreatment program has been plagued with controversy, misunderstanding, and resistance. Insufficient development and dissemination of information as to the impact of hazardous wastes on the POTWs, their sludges, and the streams into which they discharge, has lead to a general questioning of the costs versus benefits of the pretreatment regulations. This has been coupled with EPA's apparent inability to get out timely or effective guidance and policy on the pretreatment program.

Implications for Agency Management

An effective hazardous waste regulatory program under RCRA is in part dependent on an adequate pretreatment program. EPA needs to develop a more urgent and thorough implementation of the pretreatment standards.

SITE-SPECIFIC PROBLEMS

Denver-Arapahoe Chemical Waste Processing Facility

This was the only commercial site in the Region for a long time. It is now closed for failure to meet the siting requirements under state law. The facility has about 16,000 barrels of liquid waste in a disposal burial cell. It also has three surface impoundments, one of which has leaked and been ordered emptied. We have taken enforcement action against the facility on a number of RCRA violations. It is located within the major metropolitan area in the Region.

Attachment A-1

Prepared by:
Jon Minkoff
Waste Mgmt Branch

EPA REGION VIII

5/10/83

HAZARDOUS WASTE NOTIFICATION FIGURES*

State	Gen	SQG	Trans	TSD	Non-IS TSD	Fed	Withdrawals CLS	NHW	XMT	RCY	TOT	Valid Notifiers
CO	304	175	134	52	1	18	63	205	95	94	457	383
MT	101	29	33	17	2	6	7	32	39	14	92	130
ND	53	49	17	9	2	5	2	24	9	31	66	67
SD	57	21	34	1	1	9	2	110	4	34	150	97
UT	224	26	70	44	2	7	8	52	83	3	146	269
WY	109	52	45	16	-	1	6	80	44	35	165	147
Total	848	352	333	139	8	46	88	503	274	211	1076	1093

*Note:
Gen = generators, SQG = small quantity generators, Trans = transporters, TSD = treatment, storage and disposal facilities, Non-IS TSD = permit applicants not having interim status because of notifying after 8/18/80 or filing Part A after 11/19/80, Fed = federal, Withdrawals = notifiers which have fully withdrawn from the system for the reason indicated: CLS = closed, NHW = no hazardous waste, XMT = exempted from regulation (e.g., mining, particular wastes, etc.), RCY = recycling onsite or characteristic waste: exempt), TOT = total withdrawals (does not include SQGs), Valid Notifiers = active waste handlers still "in the system". These figures are subject to the vicissitudes of daily forms processing.

Source: HWDMS

Attachment A-2

Source: HWDMS

5/10/83

EPA REGION VIII

TREATMENT, STORAGE AND DISPOSAL FACILITIES*

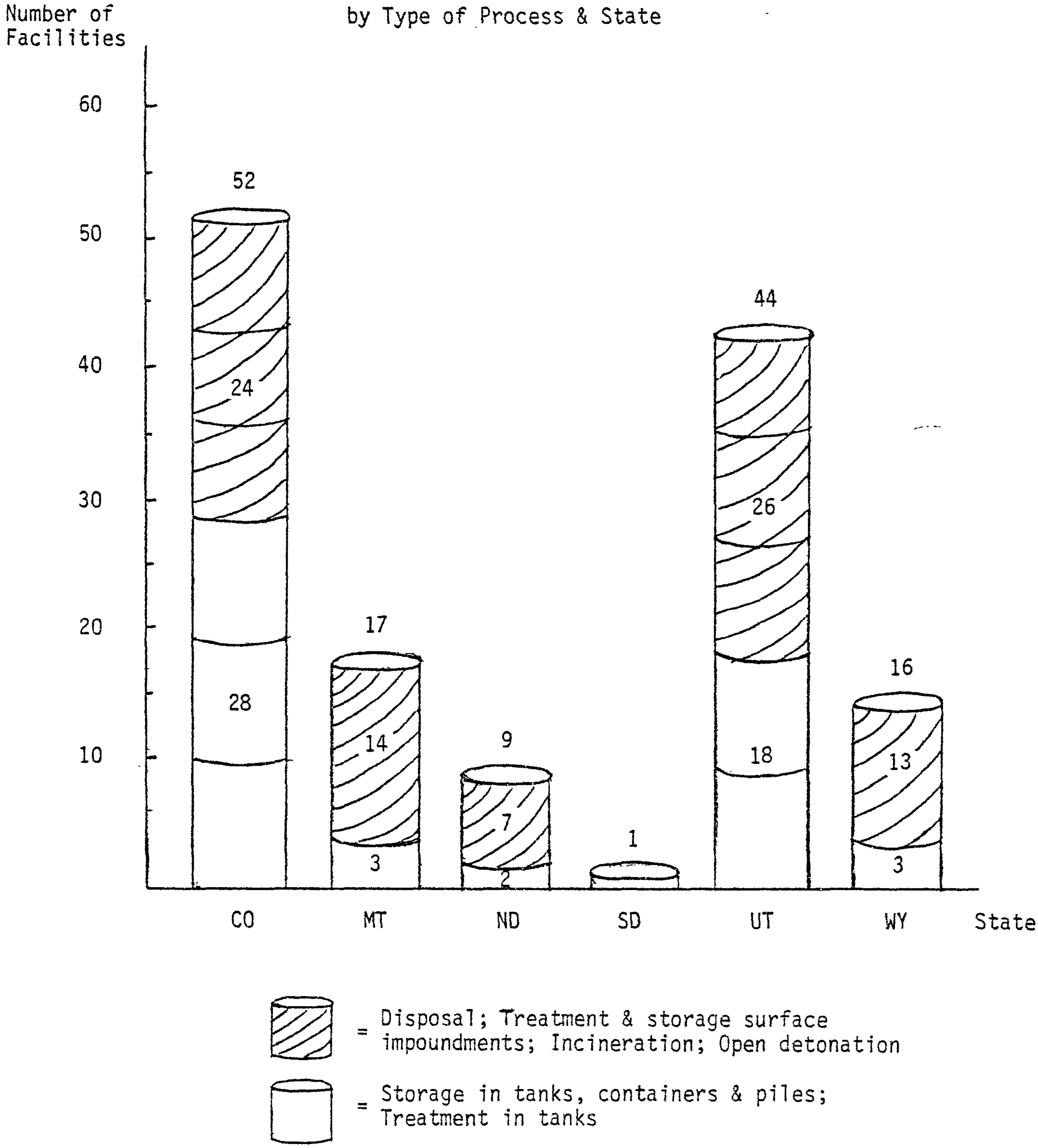
State	# of Permit Applicants	Treatment or Storage	SI/ Disposal	UIC	Incin	Open Det
Colorado	52	28	20	-	5	3
Montana	17	3	13	-	2	-
N. Dakota	9	2	7	1	2	1
S. Dakota	1	1	-	-	-	-
Utah	44	18	20	1	1	4
Wyoming	16	3	13	-	1	-
Total	139	55	73	2	11	8

*Note: This chart shows the number of TSD facilities having the processes indicated. Treatment or Storage = in tanks, containers &/or piles only, SI/Disposal = surface impoundments (storage or treatment) &/or disposal by landfill, land application, UIC or surface impoundment (facilities listed in the SI/Disposal column often have simple storage or treatment as well, but are not included in that column), UIC = underground injection control (the two UIC facilities are also included under SI/Disposal), Incin = incineration (8 of the incineration facilities also have and are included under SI/Disposal) Open Det = open detonation. These figures are not totally reliable due to protective filings, inaccurate forms, incomplete data entry, etc.

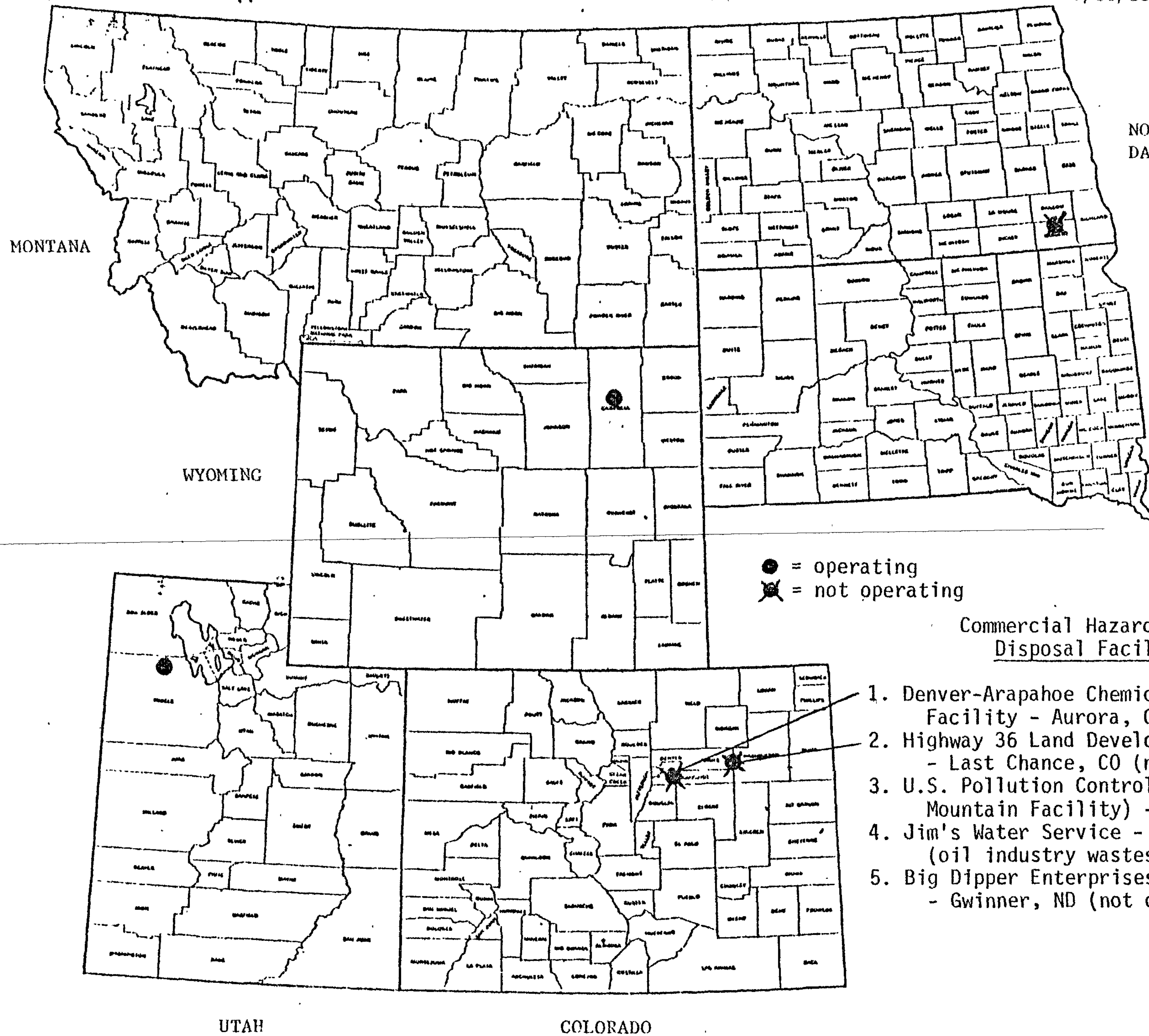
Prepared by:
Jon Minkoff
Waste Management Branch

Source: HWDMS Attachment A-3 5/10/83

Number of Hazardous Waste
Treatment, Storage & Disposal Facilities
by Type of Process & State



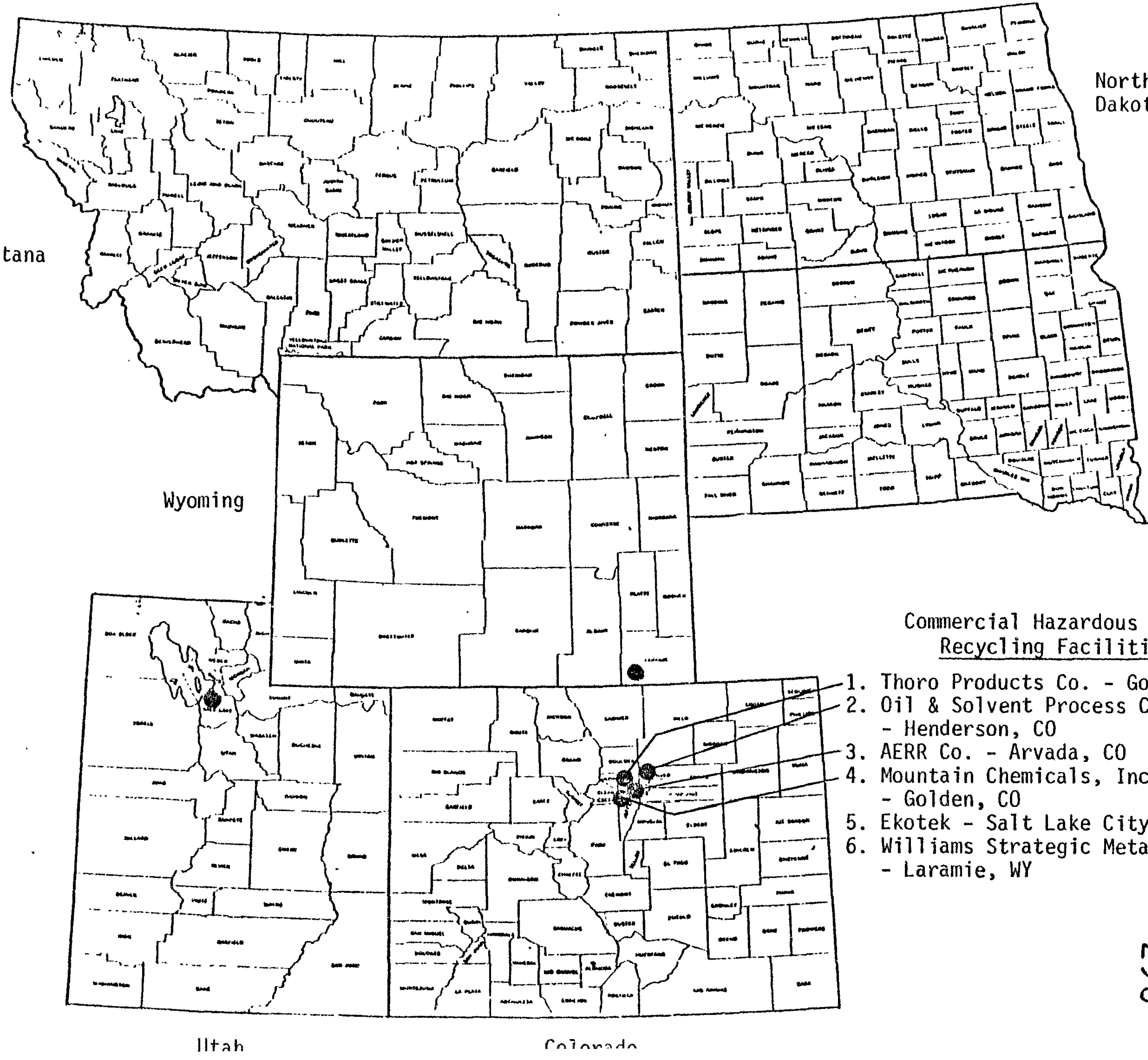
Source: Part A Permit Applications | Attachment A-4 | 5/10/83



Commercial Hazardous Waste
Disposal Facilities

1. Denver-Arapahoe Chemical Waste Processing Facility - Aurora, CO (not operating)
2. Highway 36 Land Development Corporation - Last Chance, CO (not constructed)
3. U.S. Pollution Control, Inc. (Grassy Mountain Facility) - Clive, UT
4. Jim's Water Service - Gillette, WY (oil industry wastes only)
5. Big Dipper Enterprises, Inc. - Gwinner, ND (not operating)

Source: Part A Permit Applications   Attachment A-5   5/10/83



Commercial Hazardous Waste
Recycling Facilities

1. Thoro Products Co. - Golden, CO
2. Oil & Solvent Process Co. - Henderson, CO
3. AERR Co. - Arvada, CO
4. Mountain Chemicals, Inc. - Golden, CO
5. Ekotek - Salt Lake City, UT
6. Williams Strategic Metals - Laramie, WY

Attachment A-6

Selected RCRA Sites with Significant Groundwater Contamination Problems

There are a number of site-specific groundwater contamination problems in the Region that are of concern due to the extent, nature and location of the contamination. The following are four of the more noteworthy cases.

Union Pacific Railroad (J.H. Baxter) - Laramie, WY

The facility has three surface impoundments. Preliminary data suggest they are leaking, possibly in the groundwater table. The State of Wyoming has serious concerns about the facility. We are reviewing our options under RCRA and CERCLA. The company has announced that it intends to close the facility.

Rocky Mountain Arsenal - Commerce City, CO

Basin F on the Arsenal contains hazardous waste and is contaminating groundwater. The Arsenal has been studying ways to ameliorate the groundwater problem at the site. The problem is very complex. The Part B permit application has been requested and received.

Husky Refinery - Cody, WY

The landfarm is leaching heavy metals into the shallow groundwater system and eventually to the river.

Texaco Refinery - Casper, WY

Texaco operates a leaking chemical evaporation pond. The company is working with EPA and the State of Wyoming to develop ameliorative actions and proper closure.

Source: RCRA and CERCLA inspection reports and enforcement documents

Date: 5/10/83

Attachment A-7

Oil Refineries and Associated Installations with TSD Facilities

State & Facility	Location
Colorado	
Conoco Refinery	Commerce City, CO
Gary Refining	Fruita, CO
Montana	
Conoco Refinery	Billings, MT
Conoco Landfarm	Billings, MT
Exxon Refinery	Billings, MT
North Dakota	
Amoco Refinery	Mandan, ND
Flying J, Inc. (Westland Refinery)	Williston, ND
Utah	
Amoco Refinery	Salt Lake City, UT
Amoco Remote Tank Farm	Salt Lake City, UT
Chevron Refinery	Salt Lake City, UT
Chevron Red Wash Unit	Vernal, UT
Ekotek	Salt Lake City, UT
Golden Eagle Refinery	Woods Cross, UT
Husky Refinery	Salt Lake City, UT
Phillips Refinery	Woods Cross, UT
Plateau Refinery	Roosevelt, UT
Wyoming	
Amoco Refinery	Casper, WY
Amoco Pipeline Tank Farm	Casper, WY
Glenrock Refinery	Glenrock, WY
Husky Refinery	Cheyenne, WY
Husky Refinery	Cody, WY
Little America Refinery	Evansville, WY
Sinclair Refinery	Sinclair, WY
Texaco Refinery	Casper, WY
Wyoming Refining Co.	Newcastle, WY

Source: HWDMS

Date: 5/10/83

Attachment A-8

Hazardous Waste Recyclers Posing Significant Problems

The following cases illustrate the some of the main problems associated with recyclers in Region VIII.

American Ecological Recycling Research Company (AERR Co.) - Arvada, CO

A civil complaint (under 7003 of RCRA) was initiated against AERR Co. in 1980 because the site posed an imminent and substantial threat to human health and the environment due to leaking drums, fire hazards, and inadequate plans, records and security. The Part B permit application for this facility was one of the first to be requested, and it is still under review.

Micronutrients International - Erda, UT

This facility has waste piles containing emission control flue dust (waste code K061) which are improperly managed, with the result that wind and water erosion cause migration of the hazardous waste off-site. The imminent bankruptcy and closure of the site makes matters more difficult.

Mountain Chemicals, Inc. - Golden, CO

An enforcement action was taken against this chemical recycler, which stores large quantities of ignitable solvents in a residential area. The violations included leaking drums, improper storage of ignitable liquids, and failure to obtain the required sudden accident insurance. The Part B application for Mountain Chemicals is currently under review.

Source: RCRA inspection reports and enforcement documents

Date: 5/10/83

VII.

Radiation Section
Environmental Management Report

Radiation Section (continued)

VII.

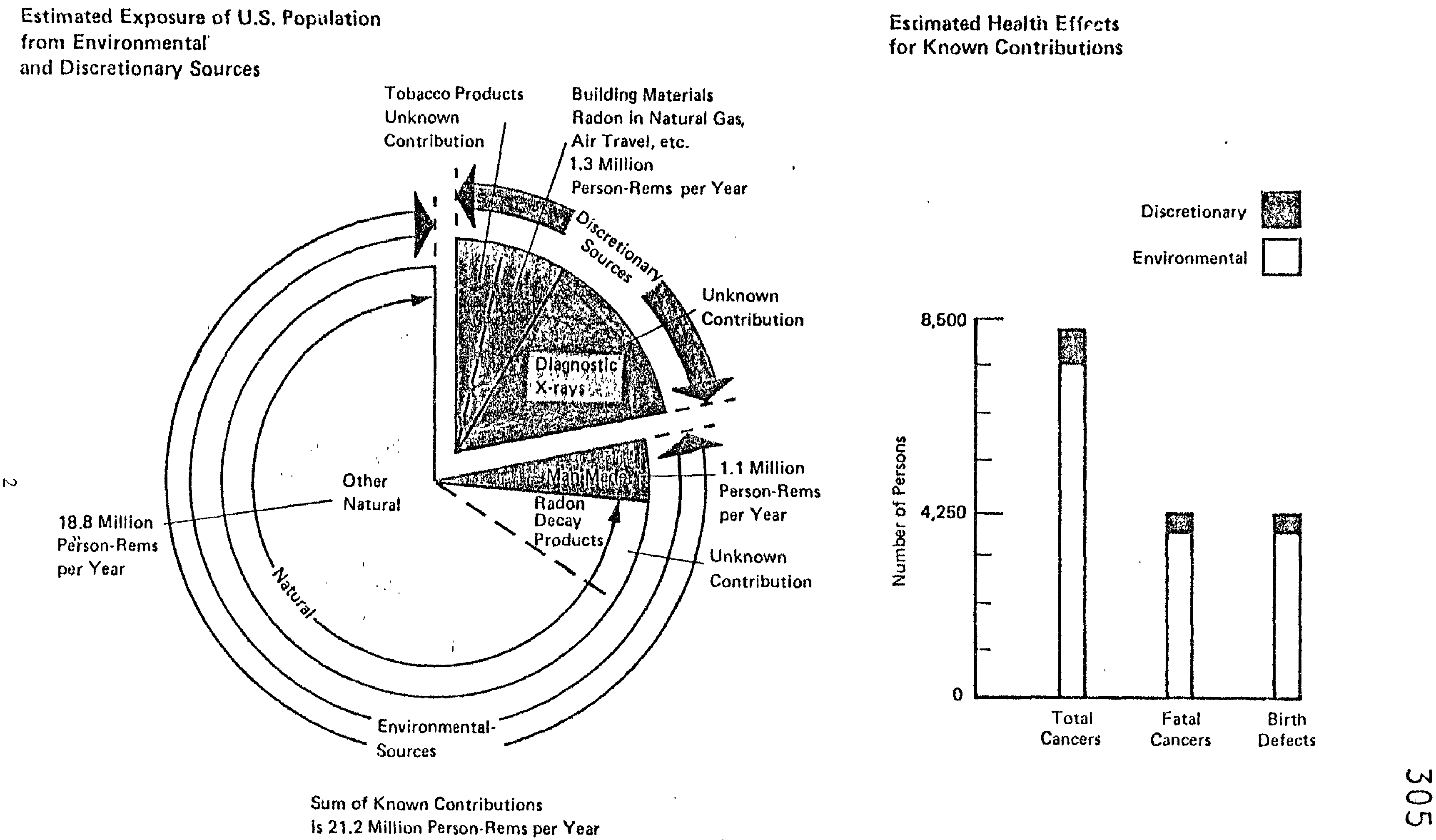
RADIATION SECTION
REGION VIII ENVIRONMENTAL MANAGEMENT REPORT

Part I: Overview of Status and Trends

EPA's primary radiation role is to reduce unnecessary and avoidable radiation doses from environmental sources. Although the Agency has done some work in the area of discretionary sources where individuals are selectively exposed, the primary thrust has been with population exposure to ambient levels and avoidable increases to those levels. Figure I shows that naturally occurring sources are the major route. It is important to note that technological enhancement of that route is the major concern in Region VIII, and hence we feel one of the more important radiation interests of the Agency. Some of the most significant reductions in environmental radiation dose to the Region VIII population are expected to occur occur during the next 5 to 10 years. Unfortunately, we also anticipate a dramatic increase in dose to some portions of the population. We explain these seemingly conflicting expectations in the overview below.

External Exposure

Gamma rays are the radiation of interest with respect to external exposure to the body. The altitude of the Rocky Mountain Region as well as its mineralization result in elevated exposure from natural cosmic and terrestrial sources. Exposures in Colorado are typically two to three times those in seacoast states. Figure II vividly depicts the national variation in background radiation, and shows that the highest levels are in Region VIII. The mineralization of this region gave birth to many mineral extraction industries. The Rocky Mountain mineral corridor as depicted in Figure III, provides visualization of the extent of this issue in Region VIII. Mines and mills brought radioactive materials from deep within the earth to the surface, where the resulting tailings could be moved by water, wind, and man, and provide additional sources of exposure to populations. The movement of contaminants from uranium mills is now being addressed by EPA's standards under the Uranium Mill Tailings Radiation Control Act and the Uranium Fuel Cycle Regulations. Airborne migration from operational sources such as coal fired power plants and phosphate operations are being considered for control by regulations issued under authority of the Clean Air Act Amendments of 1977. As a result of improved practices which are to be required by these standards and regulations, the external radiation dose to the population, especially in the near vicinity of such operations, is expected to decline over the next few years. The Regional Office is directly involved in certain aspects of standards development, particularily in working groups and steering committee interactions. Much work is needed at the Regional level to ensure that the standard developments are appropriate for the needs, that the EPA requirements are being met, and that the regional issues are recognized and addressed.

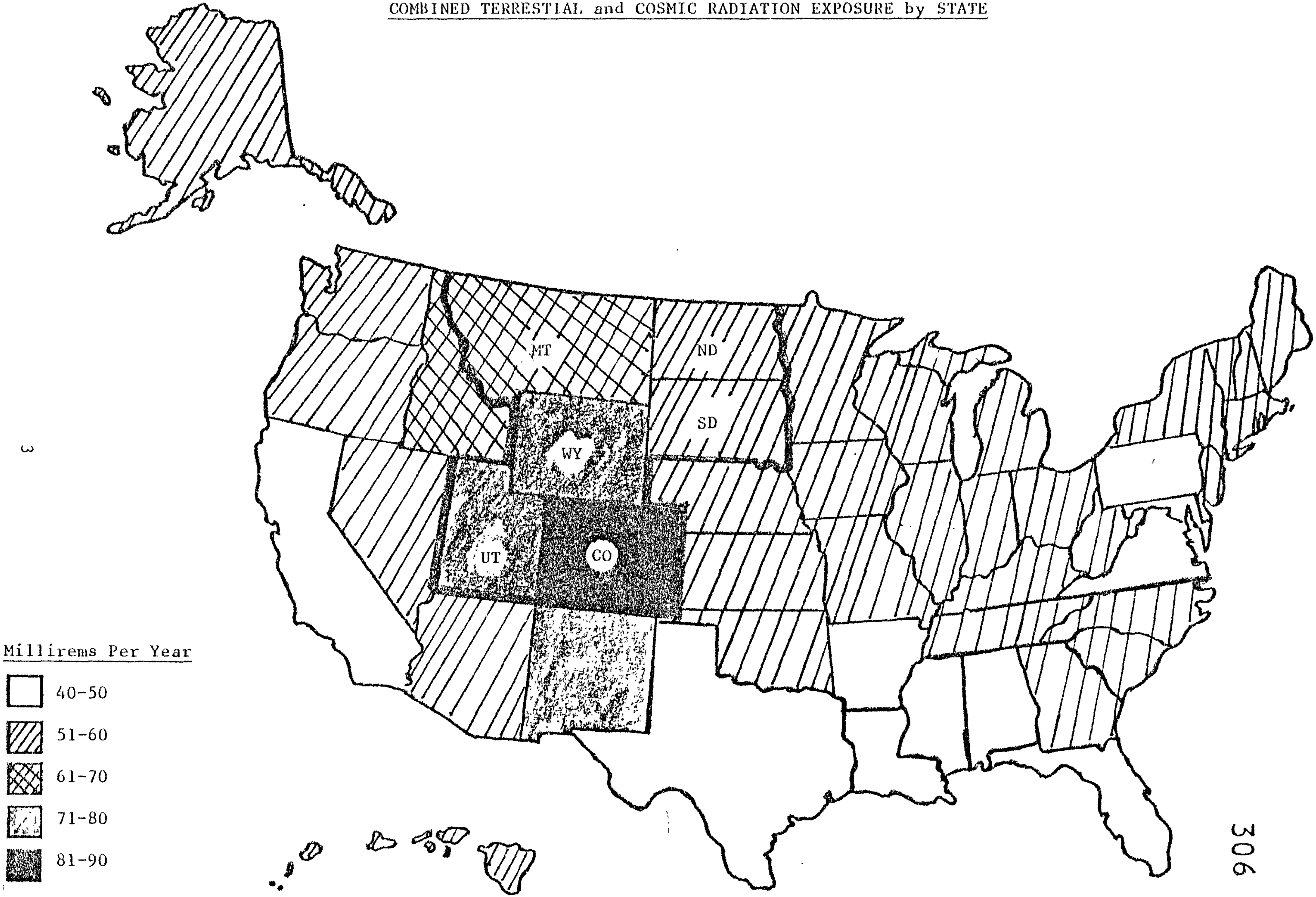


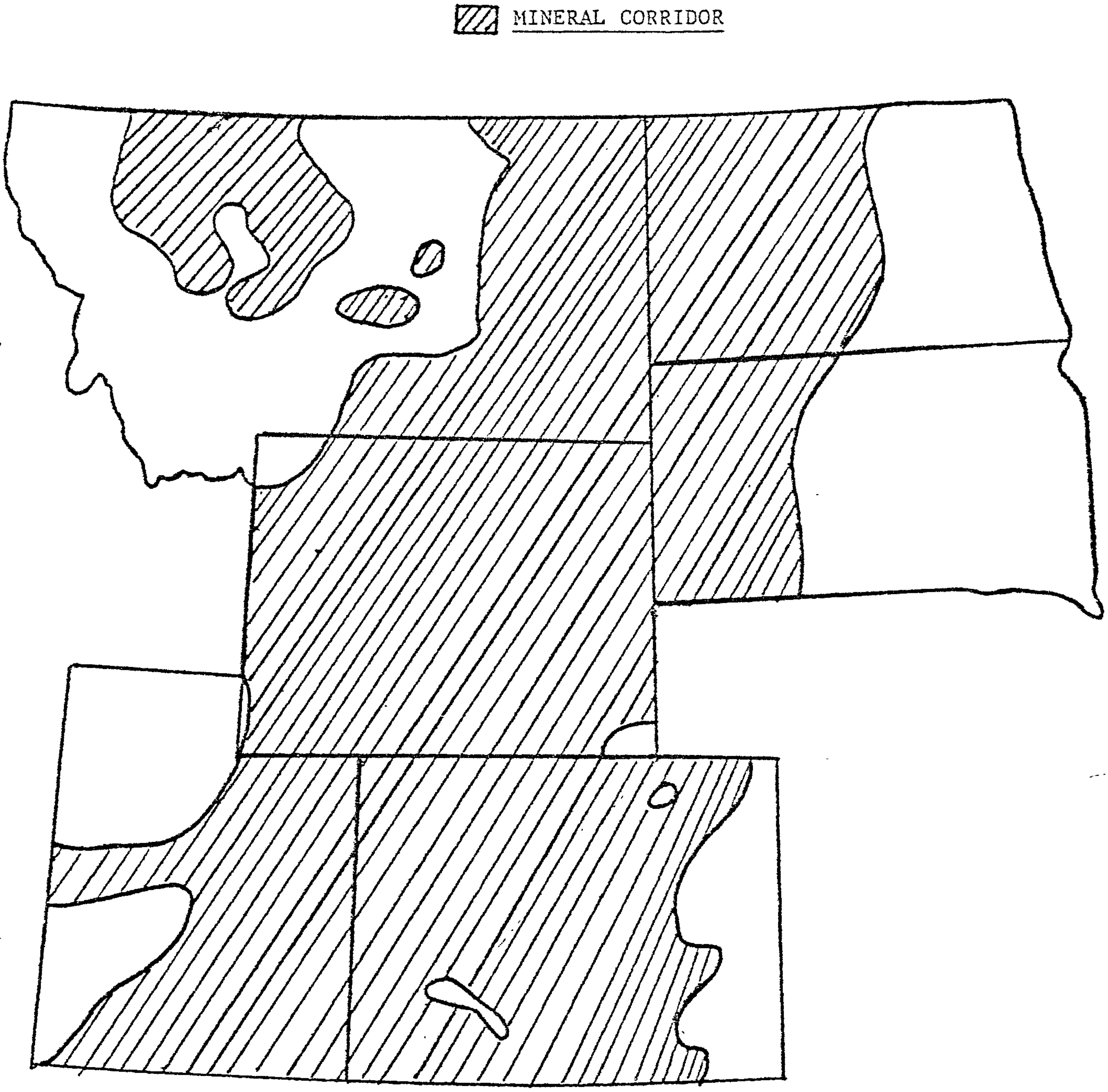
Exposure Distribution and Health Effects from Ionizing Radiation

Figure I

Figure II

COMBINED TERRESTIAL and COSMIC RADIATION EXPOSURE by STATE





Rocky Mountain Mineral Corridor

Figure III

Internal Exposure

Radiation dose to the internal organs of the body, resulting from ingested or inhaled radioactive material is of far greater concern because the doses are usually much greater than external doses and occur over longer periods, up to a lifetime. As with external exposure, the primary Regional role is closely involved with ensuring that these radiation doses will also decline as a result of controls required by the standards and regulations noted above. In addition, projects designed to remove radioactive contaminants from drinking water will further reduce the population dose. These internal dose reductions are expected to be far more significant than the reduction in external dose.

Uranium in drinking water remains a widespread problem in Region VIII. There are no regulations limiting uranium in drinking water because a cost-effective removal process has not yet been proven. Research in this area is proceeding. Another significant concern with respect to future radiation protection lies with the internal dose resulting from inhaled radioactive radon decay product concentrations in the home. A popular and inexpensive conservation measure used by homeowners that can increase these concentrations is caulking. The resulting decreased ventilation rate exacerbates the problem of elevated radon daughter levels. Since a person generally spends more time in his home than elsewhere, the increased risk of lung cancer associated with elevated radon progeny levels in the home can be significant.

Part II. Ranking of Regional Environmental Problems and Implications for Agency Management

Overviews of salient radiation medium issues are presented in Attachment A. This section draws on the material in Attachment A to provide a cursory discussion of a) the most significant radiological problems in the Region, ranked in approximate order of severity, the causes of these problems, and current and possible actions to address them; and b) the current barriers that exist to solving the problems and the implications for future Agency management.

A. Ranking of Radiological Problems

The most significant radiological problems are discussed here. The issues are ranked by health impact primarily, and political implications secondarily.

1. Uncontrolled Radioactive Waste Sites

Mining and milling have been major contributors to the Rocky Mountain Region economy throughout its history. Unfortunately, uncontrolled mining and especially milling practices have left a legacy of hazardous sites. Although it is common knowledge that uranium and radium extraction circuits result in radioactive tailings, many other milling operations such as those for vanadium, phosphate, and fluorspar also produce tailings which are radioactive. In Region VIII we are investigating about two dozen abandoned sites and defining their radiological hazards. The material has frequently been intentionally moved by contractors who need fill material and by masons who value the sandy tails for their fine qualities as aggregate in concrete and mortar. Additionally, phosphate slag and ash from coal-fired power plants have reportedly been used as fill or construction material. Since radioactivity is not detectable without instruments, it is likely that the potential hazards were neither known nor understood by the persons involved. Through these processes, as well as by wind/water erosion and leaching, the radioactive material is migrating to populated areas. Hence, the piles may pose a hazard to people living many miles away. The solution to this problem requires not only the stabilization of the piles to insure that no more material leaves the site, but also the cleanup of structures into which the radioactive materials have been incorporated. In several cases the only funding mechanism for the cleanup is the Superfund.

2. Uranium Mill Tailings Remedial Action

The Uranium Mill Tailings Radiation Control Act of 1978 ordered EPA to set standards for the stabilization or removal of tailings at 24 inactive uranium milling operations around the country, 16 of which are in Region VIII. The Act orders the Department of Energy to perform the cleanups in cooperation with the affected states and requires NRC to oversee the cleanup operations and insure compliance with the EPA standards. DOE recently issued its Draft Environmental Impact Statement (DEIS) for the first of the remedial action plans. EPA VIII was asked by Region III and by Headquarters to provide comments on the Canonsburg DEIS. The plan preferred by DOE would appear to provide environmental protection for only a few years. DOE's aim was apparently to spend as little as possible on the cleanup. In so doing, the benefit/cost ratio becomes unacceptably low, in our opinion. Since so many of the UMTRAP sites are in Region VIII, we must be especially concerned with the precedent DOE sets in Pennsylvania. If their remedial action approach does not change, we will have serious environmental and political problems at many of the 17 sites here. In order to insure against this situation, we are attending the public meetings concerning the sites in Region VIII, communicating informally with DOE, and providing detailed, formal comments to DOE on their DEIS's and FEIS's. We anticipate a very heavy work-load in the next year addressing these sites.

3. Indoor Radon Progeny

Radon, the gaseous decay product of radium, is released from the soil everywhere, but at generally greater rates in the mineralized Rocky Mountain region. When radon daughters are trapped within a structure, the inhabitants' lifetime lung cancer risk increases by about 1% for every .01 increase in Working Level, which is a measure of the radon daughter concentration. As ventilation rates decrease in response to government sponsored energy conservation programs, the radon progeny concentrations will further increase, exacerbating the problem. Figure XIV shows the routes of radon entry into homes. EPA has estimated that decreasing the average ventilation rate in U.S. homes by one-half could lead to an increase of 10,000 to 20,000 lung cancer cases per year. This year EPA concludes a study of radon progeny measurement techniques which is being conducted in Butte, Montana. Although a follow-up study of alternatives for lowering radon progeny concentrations in homes has been proposed, no funding has been made available. The Regional program is, however, providing limited technical support to a Colorado Energy Research Institute study of indoor radon levels at a few homes in the Denver area.

4. Radioactivity in Drinking Water

Due to the widespread existence of naturally occurring radioactive minerals thoughout most of Region VIII, it is not surprising that elevated levels of radioactivity also exist in a number of domestic water supplies. The map in Figure III shows the mineral corridor within Region VIII. The primary concern is with ground water, since the water from these supplies has filtered through the mineralized zones. The resulting concentrations of radium and uranium are highly variable, and not predictable from one location to the next. However, in a number of instances they exceed EPA radium standards or uranium guidance considerations. It is estimated that approximately 26% of the Colorado community water supplies will exceed the above limits, South Dakota 14, Wyoming 4, and Montana 4. Additionally, about 10 Indian water systems in Region VIII have uranium concentrations exceeding the guidance considerations. Since over 80% of the community water supplies in Region VIII are small distributors utilizing ground water, it seems likely that the number of water systems of concern will increase in the future. This is because testing for many of these water supplies has not yet been performed. From initial results though, it has been estimated that for uranium concentrating alone, over 200 Colorado supplies and 400 Regional supplies could be affected.

5. Low-Level Radioactive Waste Disposal

Commercial low-level radioactive wastes have been disposed of in shallow disposal sites across the U.S. for many years. However, most of the sites have closed due to environmental/public health risks, political pressure, poor siting, poor management, site filling, and a number of other factors. At the present time, only one site (Hanford site at Richland, WA) projects any confidence for remaining open in the foreseeable future. During the last few years, the states with active low-level commercial waste disposal sites have become increasingly agitated with the reality of being the hosts for the ever-increasing volume of the nation's low-level wastes. Resulting state-originated curbs in volumes of waste disposal, increased regulatory requirements, and non-renewal of operating permits caused recognition of the need for a national long-term waste management policy. In response to this need, the Congress enacted legislation in December, 1980, which authorizes regional compacts among states for the disposal of low-level wastes. Under this concept, host (receiving) states can refuse shipments from other non-compact states as of January 1, 1986. The major problem today is that the compact concept is not well organized, and may not provide economical disposal sites. Meanwhile, the time remaining to design and construct adequate disposal sites for the nation's needs grows increasingly short.

6. High-Level Radioactive Waste Disposal

High-level radioactive wastes are defined as being spent nuclear fuel, and both solid and liquid wastes resulting from reprocessing of irradiated reactor fuel. Although these wastes are produced in small quantities, their proper management and disposal are important because of the inherent hazards of the large amount of radioactivity they contain. The wastes contain both fission products and transuranics. These wastes have been accumulating in the country for 37 years, but no final disposal sites for the wastes are now available. To correct this, in December 1982, Federal legislation was enacted which sets a timetable for DOE to develop and operate a final disposal repository. One of the three areas under consideration is the Paradox Basin in southeastern, Utah. This consideration has been the cause of much controversy at both the local and state levels.

B. Implications of this Report

This section summarizes the barriers to resolution of the issues noted above and indicates what assistance the Region may need from Headquarters to resolve the problems.

1. CERCLA

(a) The principal barriers to the use of Superfund for radiation-contaminated sites are:

(1) The systematic bias of the Hazard Ranking System (Mitre Model) against radiation sites which are not in heavily populated areas but which need to be addressed to stop the intentional transport of radioactive material to populated areas.

(2) Lack of guidance from Superfund on what constitutes an adequate risk assessment for any particular site.

(3) Lack of a clear and unequivocal Superfund policy on the clean-up of radiation sites. (We have been told by one state that they do not want to "jump through hoops" for CERCLA if HQ is deliberately trying to throw obstacles in the path of their submission for a radiological cleanup.)

(b) The actions requested of Headquarters are:

(1) Modify the Hazard Ranking System to more equitably consider situations such as those noted above,

(2) Develop a clear policy, subject to as little interpretation as possible, concerning radiation sites,

(3) Develop a checklist with detailed examples of all documents required for Superfund consideration of a site.

(4) Provide clear guidance to states on various issues pertinent to their responsibility e.g. credits for past work, and betterment of property following remedial action.

2. UMTRAP

(a) The principal barriers associated with effective cleanup and disposal at these sites are:

(1) DOE's choice among remedial action alternatives
(2) The eqiovocal nature of the EPA inactive site standards with respect to RCRA requirements.

(b) The actions requested of Headquarters are:

(1) Provision of technical support in evaluating unusual remedial action proposals.
(2) Unequivocal interpretation of the reference in the inactive sites standards to EPA's Hazardous Waste Management System.

3. Indoor Radon Progeny

(a) The principal barriers to determination of a cost-effective control technology for radon and radon daughters are:

(1) Lack of lead authority and appropriate funding within EPA to conduct studies on control alternatives (such authority for EPA was suggested by the General Accounting Office in 1980 in its report "Indoor Air Pollution: A Growing Health Peril").

(2) OMB's decision to remove responsibility for such work from ORP and to place it in ORD while simultaneously cutting the associtated FTE's from ORP and not providing them to ORD - in effect cancelling the program.

(b) The action requested of the Headquarters is to work toward obtaining lead authority and appropriate funding for indoor air pollution problems.

4. Radioactivity in Water

(a) The major barriers to providing remedial action on drinking water supplies are:

(1) The states need to catch up on their backlog of water supply analyses in order to determine what supplies are out of compliance with requirements.

(2) Appropriate procedures are needed for disposal of radioactive sludges and other wastes associated with removal treatment processes.

(3) No guidance is available for agricultural and livestock water use.

(b) The actions requested of Headquarters include:

Provision of guidance or standards for uraniumm in drinking water and guidance for radioactivity in livestock and agricultural water uses.

5. Low-Level Waste Disposal

(a) The principal barriers to obtaining timely and satifactory waste disposal sites are:

(1) The states within the interstate compacts need to form viable agreements that address requirements for siting, operation, and final disposal.

(2) States need to commit to an interstate compact group, and the groups need to consider consolidation in order to form economically feasible operations.

(3) The entire concept must move forward in order to meet Congressionally mandated deadlines.

(b) The actions requested of Headquarters are:

(1) Development and promulgation of EPA low-level waste disposal standards.

(2) Encourage the states and interstate compact groups to move ahead aggressively in forming viable agreements and developing disposal sites within time constraints.

6. High-Level Radioactive Waste

(a) The major barriers to developing a waste repository include:

(1) State resistance to having a site within their boundaries

(2) Inconclusive testing

(3) Short time table in designating appropriate sites

(b) Actions requested of Headquarters at this time are limited to provision of timely information regarding technical issues and schedules changes.

I. URANIUM INDUSTRY

Inactive/Abandoned Uranium Mills

In November 1978 the Uranium Mill Tailings Radiation Control Act (UMTRCA) became law. In the Act, Congress ordered EPA to develop standards for the decommissioning of 25 inactive uranium mill sites and contaminated properties in the vicinity of each. The law was designed to manage the health risks associated with uranium mill tailings, which pose a greater long term ingestion hazard than high level waste from nuclear reactors (see Figure IV). The Department of Energy is tasked by UMTRCA to perform the cleanup operations, and the Nuclear Regulatory Commission is required to oversee the cleanup efforts and insure that the EPA standards are met.

EPA published its standards for the 26 sites in January, 1983. DOE published an EIS for the first cleanup in November, 1982. Cleanup of all the sites is expected to cost $300 - 400 million. Sixteen of the 25 sites are within Region VIII as shown in Figure V. The Region VIII office is reviewing the EIS's for each cleanup and providing technical advice when necessary. It is hoped that within 7 years every one of the 26 sites will have been decommissioned.

Active Uranium Mills

The Uranium Mill Tailings Radiation Control Act also specified that EPA develop standards to protect the public health and safety from hazards associated with tailings at active sites (Figure VI). EPA proposed those standards in April of 1983. These standards set limits on emissions of radiation and hazardous materials from active and decommissioned facilities in order to prevent the spread of contamination (Figure VII). For years, a number of tailings impoundments were designed to leak as a means to discharge excess water. Contaminated aquifers have been the result. The "active mill tailings standards," will insure that such design is not used in the future.

The active site standards will also help insure that the decommissioning of currently licensed facilities is done appropriately. NRC has yet to preside over the decommissioning of a uranium mill. These standards will provide guidance to NRC as it addresses the many mills which may close permanently due to the currently depressed market for uranium.

The active site standards may also be used to delineate cleanup criteria for aquifers and lands which have become contaminated as a result of accidents or leakage at currently licensed mills.

Comparison of Toxicity of High Level Wastes and Uranium Mill Tailings

Figure IV

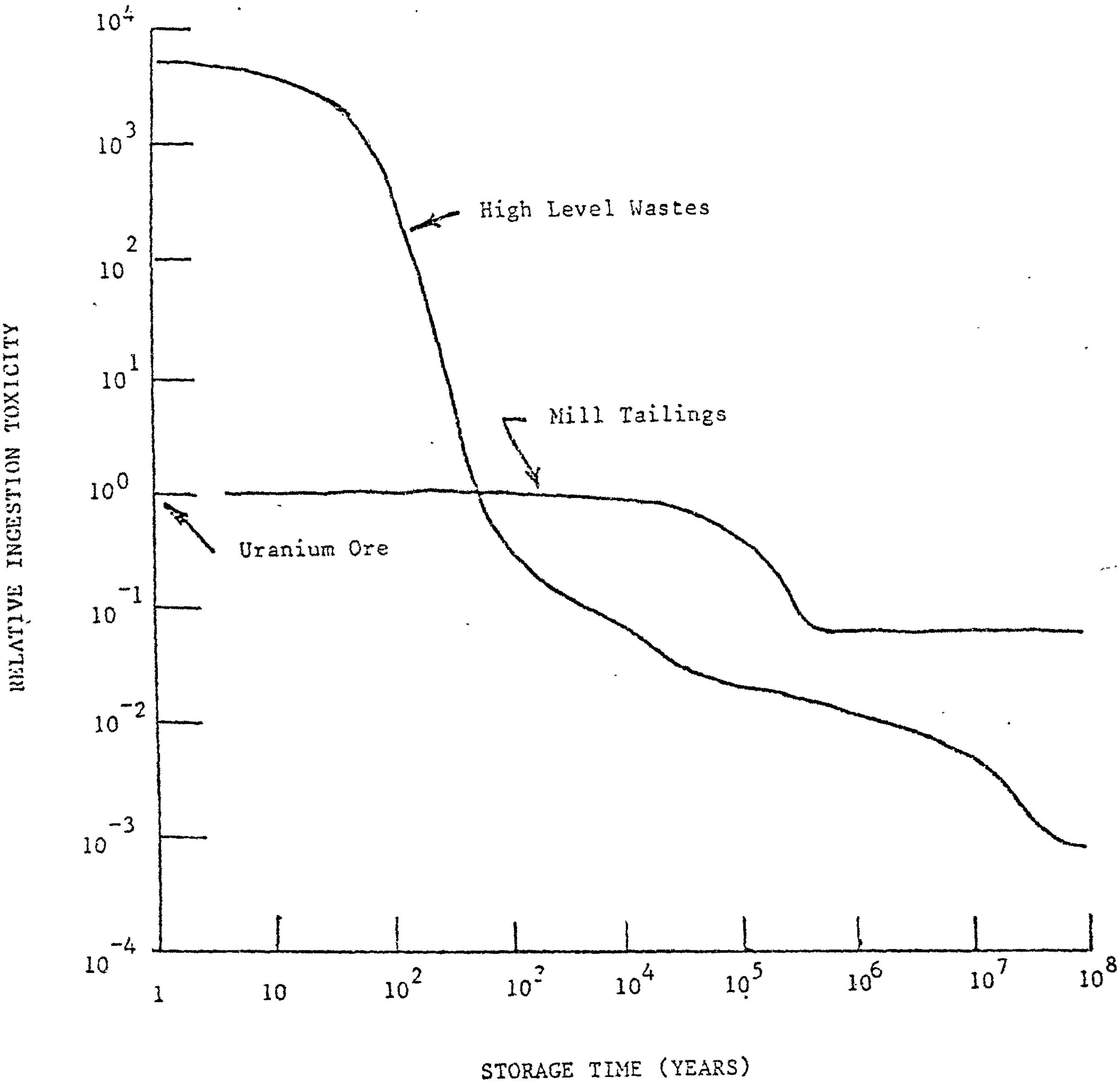


Figure V

LOCATION - UMTRAP SITES

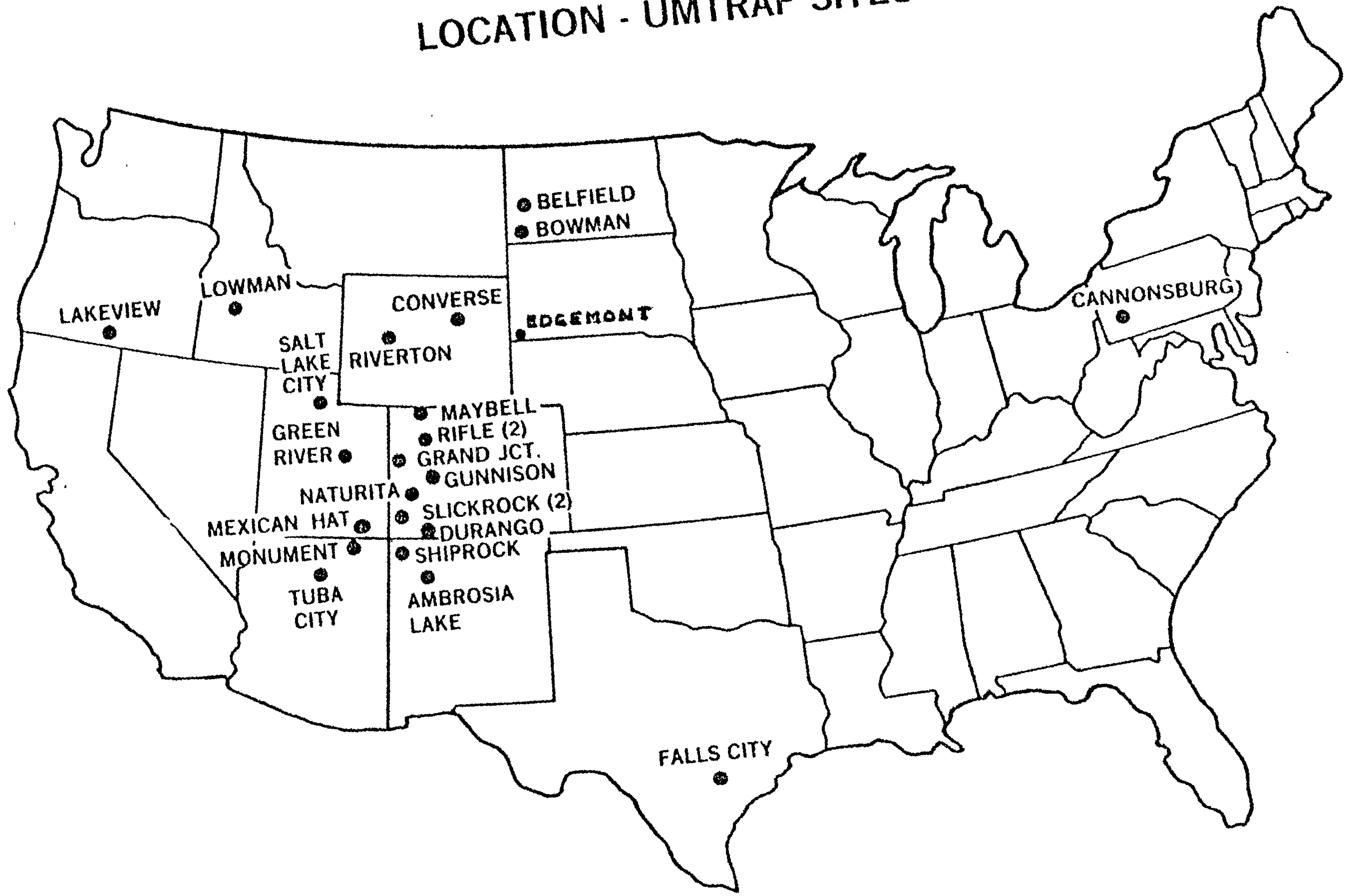
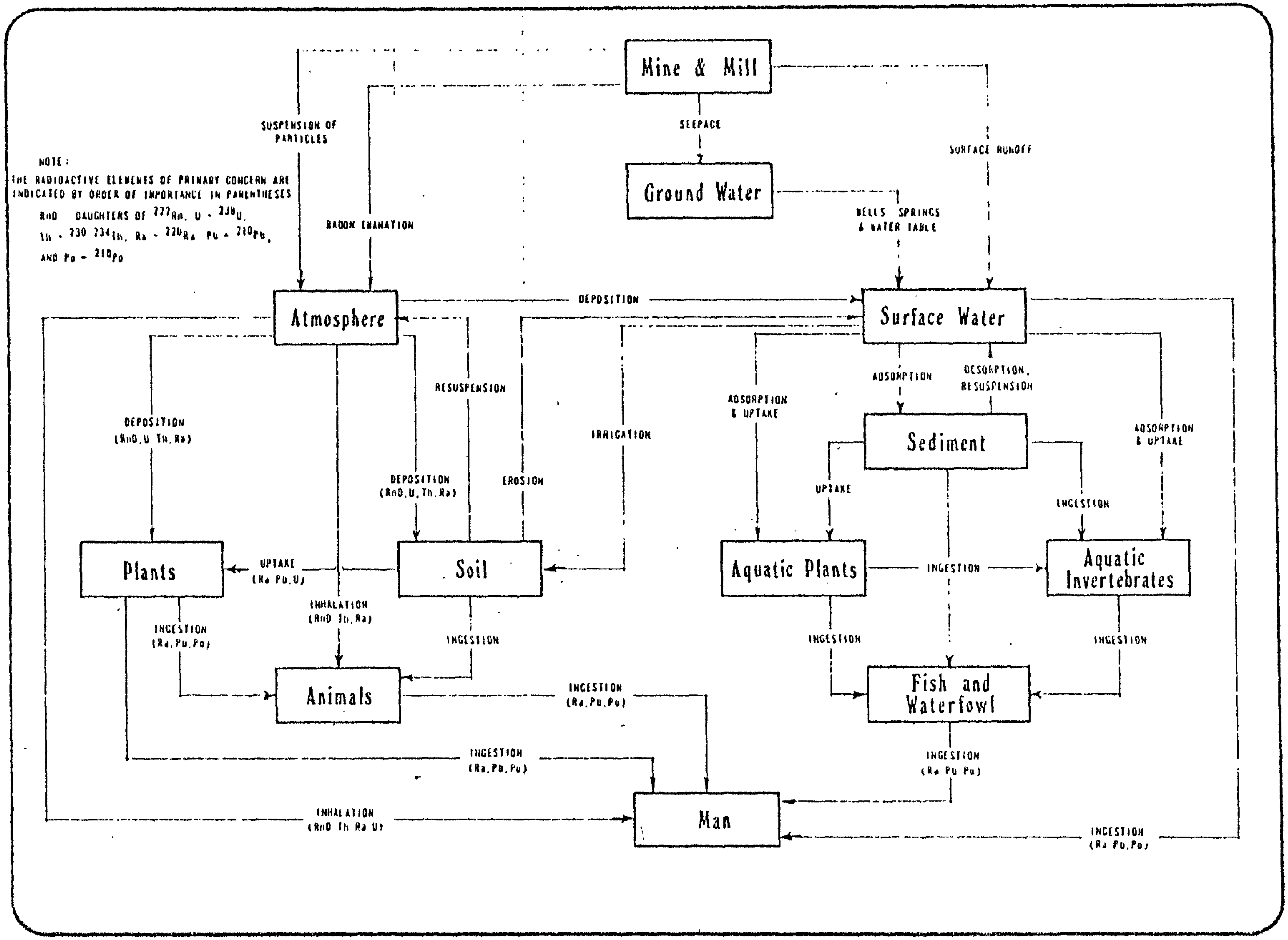


Figure VI **U.S. Uranium Processing Plants: Operating as of January 1, 1981**



Environmental Pathways for Mine and Mill Effluents

Special Concerns

Uravan Mill, Uravan, Colorado

EPA's Uranium Fuel Cycle Standards (40CFR190) set limits on the dose an individual in the general public may receive due to the uranium fuel cycle facility operations. Uranium milling operations are a part of the fuel cycle. Studies have shown that the only mill in the nation which does not comply with these standards is Union Carbide's Uravan operation. The Regional Radiation Program is working with the Colorado Department of Health in evaluating tailings management plans which, when implemented, would limit the exposure to the general public.

Edgemont Mill, Edgemont, South Dakota

The Edgemont Mill, though not operating, has an active NRC license. TVA, the owners, plan to decommission the mill in the next few years. EPA Region VIII found major flaws in the decommissioning plan approved by the NRC, and has discussed options for resolution with EPA HQ, NRC, and the office of Senator Abdnor of South Dakota. The offsite cleanup has been assured by passage of a recent bill, introduced by Senator Abdnor, which includes the Edgemont offsite remedial actions under the UMTRCA program managed by DOE.

Cotter Mill, Canon City, Colorado

The Cotter Corporation mill near Canon City, Colorado, has long been suspected of contaminating the aquifer beneath the Lincoln Park residential area with leachate from the its tailings ponds. Because ground water studies are time consuming, difficult, and subject to interpretation, the allegations against Cotter have not been proven. EPA is currently sponsoring a detailed study of existing data from the Cotter environs to narrow future investigations to the most productive avenues. Region VIII has been assisted by the Colorado Department of Health in our investigations.

Vitro Uranium Mill Tailings Site, Salt Lake City

The Vitro tailings site is an abandoned uranium milling operation located in Salt Lake City. Contamination by the tailings extends to the surrounding area and dwellings. The Vitro site is one of the high priority remedial action sites under DOE's Uranium Mill Tailings Remedial Action Program. The Department of Energy would like to stabilize the pile in place. However, this would limit the usefulness of the land to the Central Valley Water Reclamation Facility Board which owns the land and proposes to expand its treatment facilities onto the site by means of an already- awarded EPA grant. The Region VIII Radiation Program has discussed the options with DOE and the Central Valley authorities and reviewed and commented on DOE's draft EIS for the cleanup of the Vitro site which was released in February, 1983.

Uranium Mines

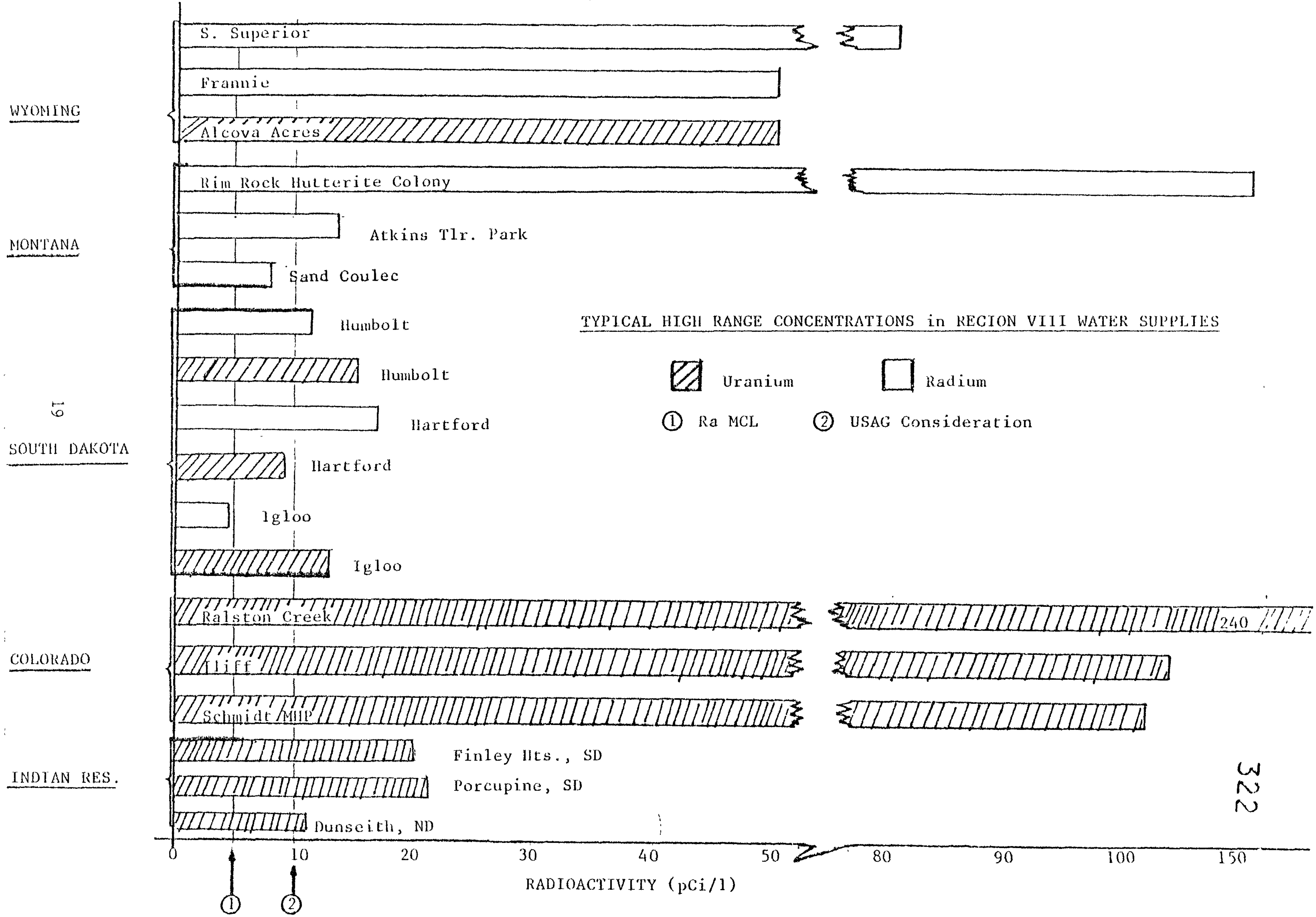
NRC doesn't have authority for regulation of uranium mining, so that responsibility is left to the states. This is a major issue in Wyoming, and has become even more pronounced now because of the depressed mining industry and resulting closure of mines. For some time, the state has recognized the importance of mine site preoperational monitoring and adequate decommissioning and reclamation requirements. Accordingly, the state has developed monitoring, control and reclamation requirements that are designed to minimize impacts and preserve natural resources for future uses. There is some evidence that other states have reviewed Wyoming's lead and are interested in implementing similar controls. A recent problem, however, is associated with mine closures from a financially strapped industry. Many of these mines were inadequately developed and no resources were set aside for adequate reclamation. Additionally, the mining companies are reluctant to admit that they will have no future interest in the mines. These circumstances have placed the state in the difficult position of balancing industry needs with environmental concerns.

II. Radioactivity in Ground Water

It appears that naturally occuring radioactivity in ground water is an important issue in South Dakota, Wyoming, Colorado, and parts of Montana, although only Colorado has detailed monitoring records. Compliance with the requirements of the EPA Interim Primary Drinking Water Standards is the highest priority, but a number of other concerns exist with respect to concentrations of uranium (for which neither standards nor guidance exist), and with respect to other uses of water (including livestock, agriculture, and wildlife uses). In most cases the issue involves avoidance of naturally occurring, but elevated, radioactivity levels, but in other cases the issue involves what we term "technologically enhanced levels of naturally occurring radioactivity". In some of these cases (such as the Midland, SD and North Table Mountain/Ralston Creek drinking water supplies) interagency cooperation has brought about encouraging resolutions. In other cases, the water suplies still await innovative resolution and/or guidance. The attached Figure VIII shows a typical range of elevated uranium and radium concentrations in drinking water supplies for the most affected states in the Region. Although sketchy (due to incomplete sampling) the chart can be used as an indicator of the type and level of concern within the states. It is fairly evident that much more work is needed, and that EPA Region VIII involvement is instrumental.

Radioactivity in Selected Water Supplies in Region VIII

Figure VIII



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III. CERCLA ACTIONS

Under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, twelve uncontrolled radioactive hazardous waste sites have been identified in Region VIII. The attached map of many of the CERCLA investigation sites (Figure IX) shows that the sites are concentrated in Colorado, with several other sites located in Utah, North Dakota, and South Dakota. All of the sites are associated with past generations of mining, milling or refining of radioactive material. In some cases the ore was processed for the radioactivity content (uranium or radium), and in others (such as vanadium production) the radioactivity was an unwanted contaminant. In all cases, the radiation issue is the result of technologically enhanced naturally occuring radioactivity remaining in the waste materials. The waste material is subject to further degradation, and is a source of radiation exposure to the public.

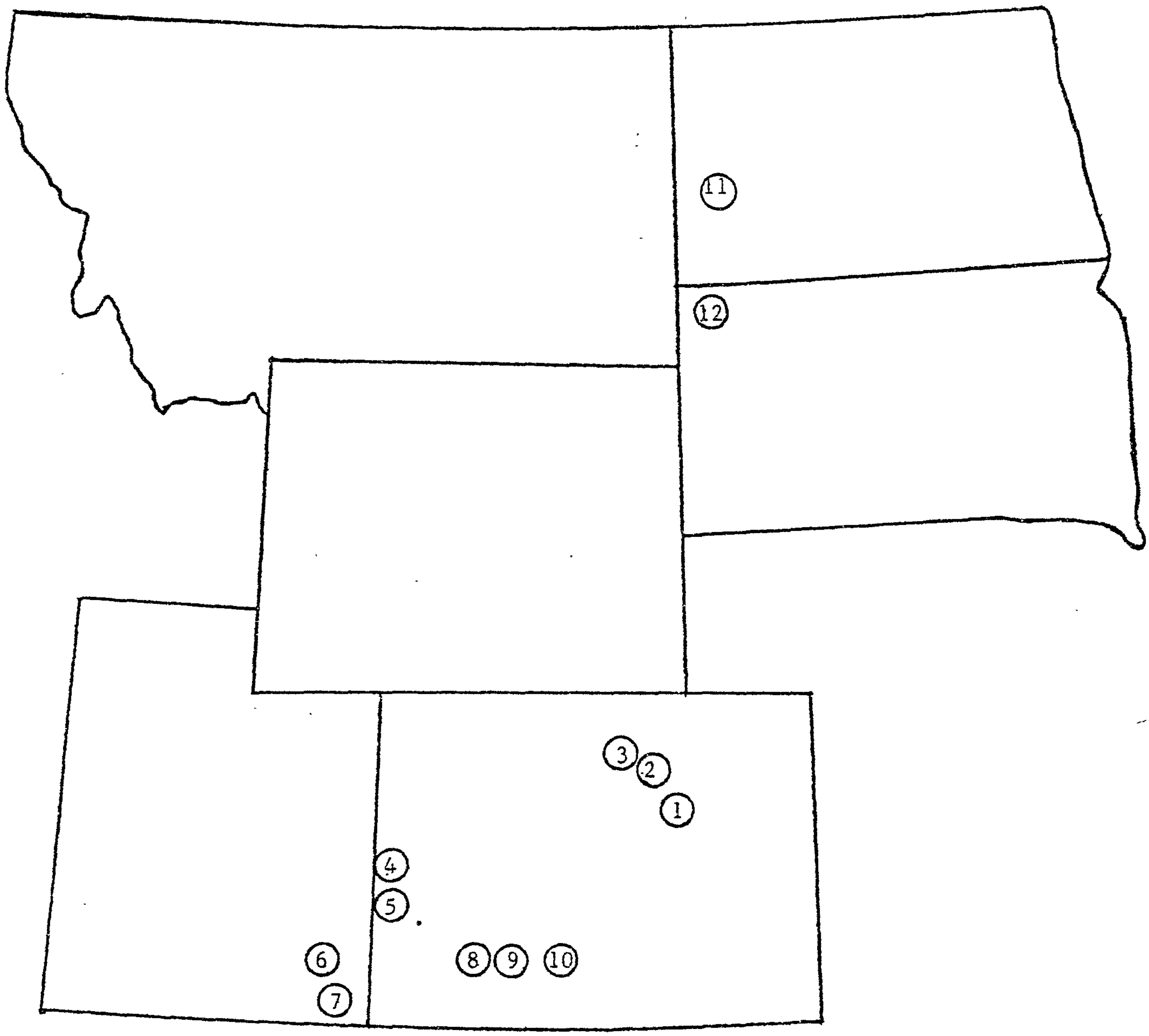
Denver Radium Site

The CERCLA National Priorties List published on December 30, 1982, includes the Denver Radium Site among its 418 listings. This means that the Denver Radium Site is eligible for consideration of expenditure from the CERCLA Superfund resources for site investigation, cleanup, and disposal purposes. Figure X shows the locations of radium wastes which are undergoing investigation. These include business locations, open land, and streets and alleys. The primary health risk comes from exposure to gamma radiation and to inhalation of radon gas decay products. The health risk involves both existing and potential radiation exposures.

The Denver Radium Site is the result of poorly understood health risks, and many years of neglect. The issue started in the early 1900s when radium was highly touted as a panacea for ill health. During that time, a number of ore processing and product fabrication facilities sprang up with little regard for the voluminous wastes generated (Figure XI), or the facilities contaminated. Although the operations have long since terminated, the radium, with a half-life of 1620 years, is still as hazardous today as when it was originally refined.

Under a cooperative agreement with EPA, the Colorado Department of Health has developed seventeen individual site engineering assessments and remedial action plans. Additionally, they have prepared a report for all the streets and alleys, and a general summary report which describes the remedial action work performed previously. Another report which evaluates final disposal site alternatives was recently completed. At this time, CDH and EPA are undertaking another cooperative agreement to finish the assesments, and perform a feasibility study. Meanwhile the Regional Office is developing a health risk analysis, and preparing for corrective action work.

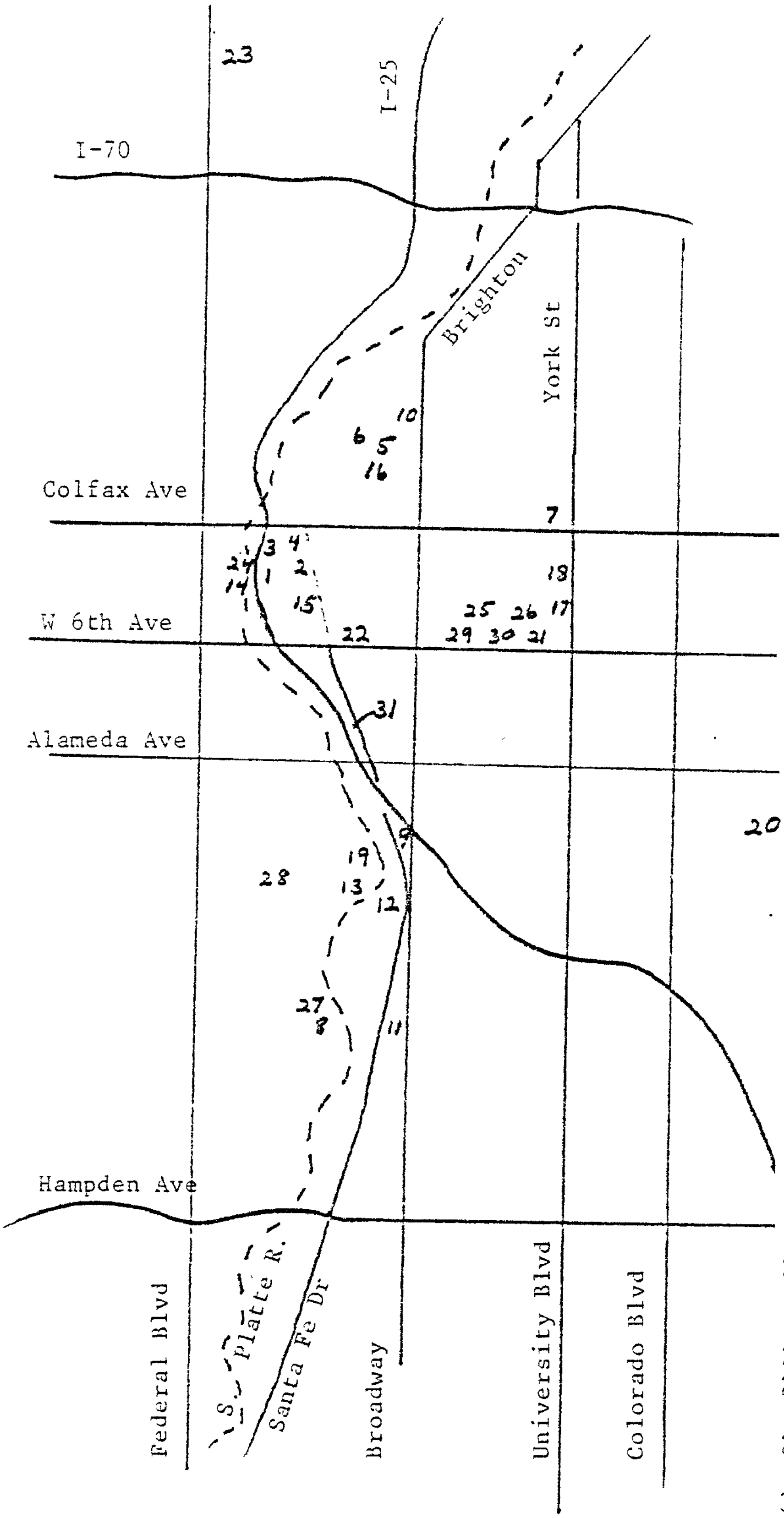
Figure IX CERCLA INVESTIGATION SITES



SITE INFORMATION

1. Denver Radium site, included in National Priority List.
2. Hendricks Mill, active.
3. Jamestown Mining District, inactive.
4. Loma vanadium site, inactive.
5. Gateway vanadium site, inactive.
6. Monticello vanadium tailings use.
7. Inactive tailings site, still to be assessed.
8. Sawpit vanadium site, inactive.
9. Placerville vanadium site, inactive
10. Vanadium mill, inactive.
11. Abandoned uraniferous lignite mines, Belfield/Bowman, ND.
12. Abandoned uraniferous lignite mines, Cave Hills, SD.

Figure X DENVER RADIUM SITES

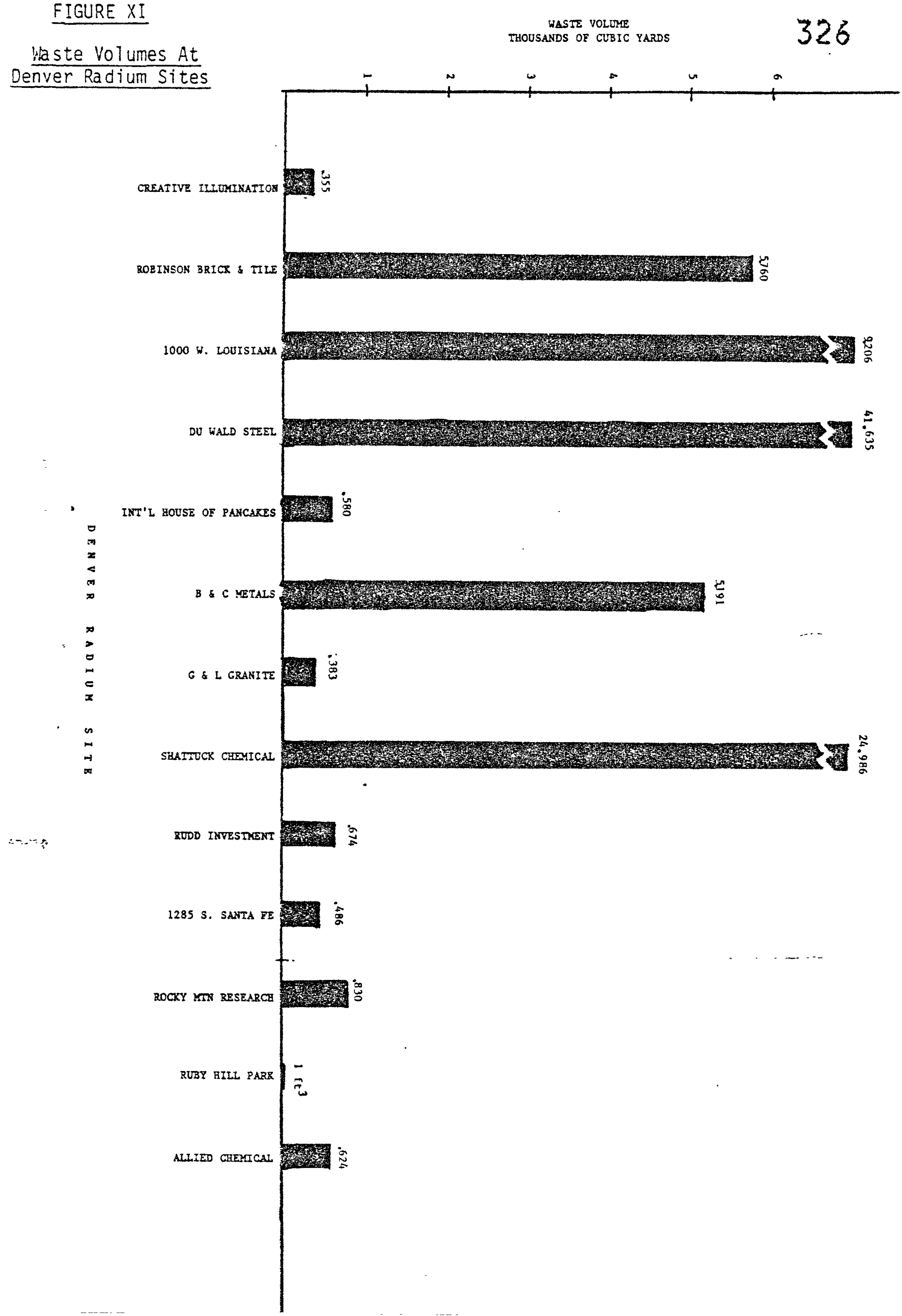


LEGEND

1. Du-Wald Steel Corp.
   1100 Umatilla St.
2. B&C Metal Products
   1625 West 12th St.
3. G & L Granite Co.
   1241 Quivas St.
4. Mtls. Handling Equip. Co.
   1740 W. 13th Ave.
5. Whsle Office Equip. Co
   1429 13th St.
6. CO. So. RR property
   adj. to 2301 W 15th St.
7. International House of Panacakes
   2001 E. Colfax Ave.
8. Card Corp.
   1314 W. Evans Ave.
9. Robinson Brick & Tile Co.
   500 So. Santa Fe Dr.
10. Middle of 23rd St.between
    Stout & Lawrence Sts.
11. Shattuck Chemical Co.
    1805 S. Bannock St.
12. Structure & lot 1295 S. Sante Fe Dr.
13. Vacant lot 1000 W Louisianna Ave
14. Parking lot 1190 Yuma Court
15. Rudd Investment Co.
    1229 Quivas St.
16. Univ. Bldg. 910 16th St.
17. York St. between
    E 6th to E 13th Ave.
18. Four block area--E 11th Ave.
    from York St to Chessman Park
19. Creative Illumination Inc.
    1298 S Kalamath St.
20. Vacant house 590 S Forest St.
21. Lafayette St. between
    1st and 7th Avenue
22. An alley between Mariposa
    and Lipan St. near 6th Ave.
23. Brennan Sand & Gravel Co.
24. 1030 Yuma St.
25. 9th Ave. and Corona St.
26. Marion St. from
    6th to 10th Ave.
27. Ruby Hill Park SW corner
28. Vacant lot S Pecos St. &
    W Arizona Ave.
29. 8th Ave from Ogden to
    Downing St.
30. 9th Ave from Lafayette
    to Humbolt St.
31. Allied Chemical
    1271 W Bayaud

FIGURE XI

Waste Volumes At Denver Radium Sites



Monticello, Utah

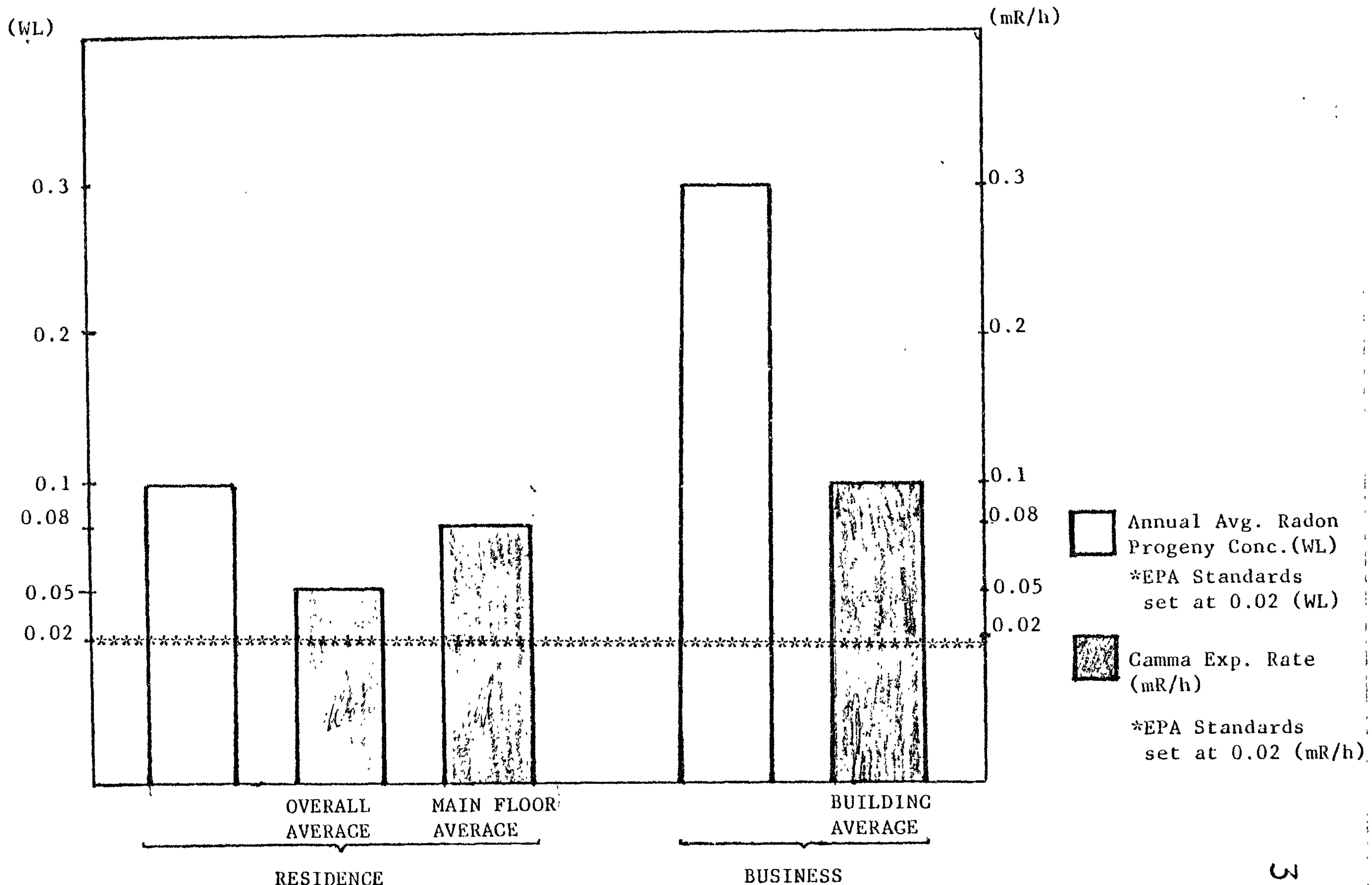
Monticello is the site of two structures which were constructed with radioactive tailings from a nearby uranium mill. In February 1982, Region VIII submitted a request to EPA headquarters for planned removal operation at the two locations. The request was denied by the HQ Superfund office despite the fact that the elevated radon and radon progeny concentrations in the structures present a serious health risk to those who live and work there as shown in Figure XII. Additional attempts to secure a CERLA-funded cleanup have been unsuccessful, but the Regional Office continues to pursue a solution to the problem. Most recently, an increase in the hazard ranking model score required to place a site on the National Priority List, has once again removed Monticello from consideration for a CERCLA funded cleanup.

Colorado Vanadium Sites

Eleven sites from North Dakota to southern Utah are the subjects of this group of investigations shown in Figure IX. All are related to mining/milling operations, most of which are now inactive. At the Western Slope sites vanadium and uranium were milled, leaving large radioactive tailings piles which are now suffering wind and water erosion. More important, however, is the fact that tailings from these unstabilized piles have been intentionally removed by people who valued the tails as fine sandy fill or building materials, but who were presumably unaware of their radioactive nature. Once incorporated in a structure or used as fill beneath or next to the foundation of a building, the tails can increase the radon and radon progeny levels in the structure. Elevated radon progeny concentrations have been correlated with an increased risk of lung cancer in inhabitants of buildings so contaminated. Although investigations have been performed at most of these sites, some studies await the spring of 1983.

The Hendricks Mill, in Boulder, Colorado, was the site of a fluorspar milling operation which began in 1936 and continued at about 100 tons/day under various owners until 1974. The fluorspar milling ceased in 1974 when a massive cave-in at the Burlington Mine in the Jamestown mining district cut off the ore supply to the mill. The radioactive fluorspar tailings, and some radium mill tailings brought to the Hendricks site in 1970, make the Hendricks impoundment moderately radioactive. Although the tails which are in the impoundment are secure, there was a breach in the impoundment at one time and apparently a break in the slurry pipeline, both of which allowed the tailings to flow beyond the impoundment. Those tailings are visible outside of the impoundment, and although they do not appear to pose any serious threat to the environment, good practice dictates that they should be returned to the impoundment.

Figure XII MONTICELLO, UT RADIOACTIVE TAILINGS ISSUE



Uraniferous Lignite Mines

In extreme southwest North Dakota and northwest South Dakota there are approximately a dozen abandoned lignite (low-grade coal) mines which produced relatively high-grade uranium ore during the late 50s' and early 60s'. These strip mines vary in size from a few city blocks to rather large surface disruptions approaching a mile or so in length. The ore was purchased under government contract after an ashing process in either the mine pits or at separate rotary kiln facilities. Upon termination of the government contracts, the mining and ashing ceased, and the sites were abandoned with essentaially no reclamation. Several large corporations were involved. Under the Uranium Mill Tailings Remedial Action Control Act of 1978, DOE accepted two rotary kiln sites for remedial action, but rejected the mine sites. EPA Region VIII participated in a pilot project cleanup of one small mine site under the direction of various ND state agencies, and funding by the U.S. Office of Surface Mines. However, a number of larger mines still need site assessment, and remedial action consideration. Of highest priority are those sites where ashing occurred in the pits. At some of these sites offsite contamination is evident, past episodes of livestock molybdenosis have been documented, and concern for public exposure and continued degradation persists. The EPA Regional Office expects to provide continued monitoring equipment and technical assistance as resources permit.

IV. Radioactive Waste Disposal

Low-Level Waste

Since the December, 1980, Congressionally-enacted legislation authorizing regional compacts for disposal of low-level wastes, the states have divided into interstate compact groups. In Region VIII, the states have divided into four different compacts, with one of the states negotiating with more than one compact group. The State of Colorado produces by far the largest quantity of wastes (as shown by the following table), and has taken a DOE-financed lead for finalizing the Rocky Mountain Compact. Since most of the other states within the Region have not chosen to affiliate with the Rocky Mountain Compact, the leads for compact negotiations involving the other states are outside Region VIII. Accordingly, we do not have as much information on the status and direction of those negotiations. This means that we will need to maintain more direct involvement with the individual states in order to ensure that a comprehensive waste management policy for Region VIII is maintained. Our current primary concern is with the apparent lack of committment on the part of some states, to form timely and economically feasible compacts. At this time, it appears that the states' main interests are in minimizing their role and liability. EPA Region VIII is also concerned with the timely development of EPA low-level waste standards which will affect Regional waste management policy, but these unfortunately are a low priority in standards development.

High-Level Waste

Another radioactive waste disposal issue is high-level waste. Military high-level and transuranic wastes are the sole responsibililty of the federal government, and they are temporarily stored at federal facilities. As it looks now, these wastes will be solidified and disposed of at the Carlsbad, NM Waste Isolation Pilot Project site. Spent fuel assemblies from commercial nuclear power plants are currently kept in rapidly-filling storage pools at the plant site. Part of the reason for the storage pools nearing capicity is the federal policy of not reprocessing spent fuel for plutonium non-proliferation reasons. Although Region VIII is not impacted by the shortage of storage space, one of the prime areas under review for a waste disposal repository is located in Utah. This site is under consideration for inclusion in a list of five candidates from which the best site will be selected in 1985, with construction beginning about 1990. As might be expected, the site has generated considerable controversy which is expected to increase dramatically as the Congressionally-mandated dates draw nearer.

Low Level Radioactive Waste Volumes & Interstate Compacts

State Name	Volume (annual m^3)	Compact	Alternate Compact
North Dakota*	4	Midwest	
South Dakota	1	Midwest	
Montana	6	Northwest	
Wyoming	400	Rocky Mtn.	North West
Utah	2022	Northwest	
Colorado	24584	Rocky Mtn.	

* The North Dakota Legislative Assembly recently defeated a bill for entering the Midwest Compact. Waste disposal plans are uncertain.

Total National Volume = 151,540 m^3 annually which includes commercial, nuclear power, medical, industrial, government, and military wastes.

V. Nonionizing Radiations (NIR)

Forms of nonionizing radiation that are familiar to most of us are visible light, infrared radiation from a heat lamp, radio frequency radiation used in the transmission of AM and FM radio and VHF and UHF television, microwaves used to heat food or as communications carriers, and the electric and magnetic fields associated with power sources like high voltage transmission lines. The Radiation Programs Office routinely receives inquiries concerning the bioeffects of nonionizing radiation associated with radio and TV transmission towers and with high voltage transmission lines (HVTL's).

High Voltage Transmission Lines

We have prepared a form letter discussing the hazards associated with HVTL's - primarily relating to electric shock - and distribute this letter with two supporting documents in response to inquires. With respect to hazards associated with NIR near radio and TV transmission towers, EPA is currently developing guidance on the maximum allowable ambient NIR levels in the appropriate frequency range. It is anticipated that the FCC will use this guidance when it considers applications for new transmission licenses. This guidance is supported not only by consumers but also by industry which prefers uniform federal guidance to a proliferation of local regulations.

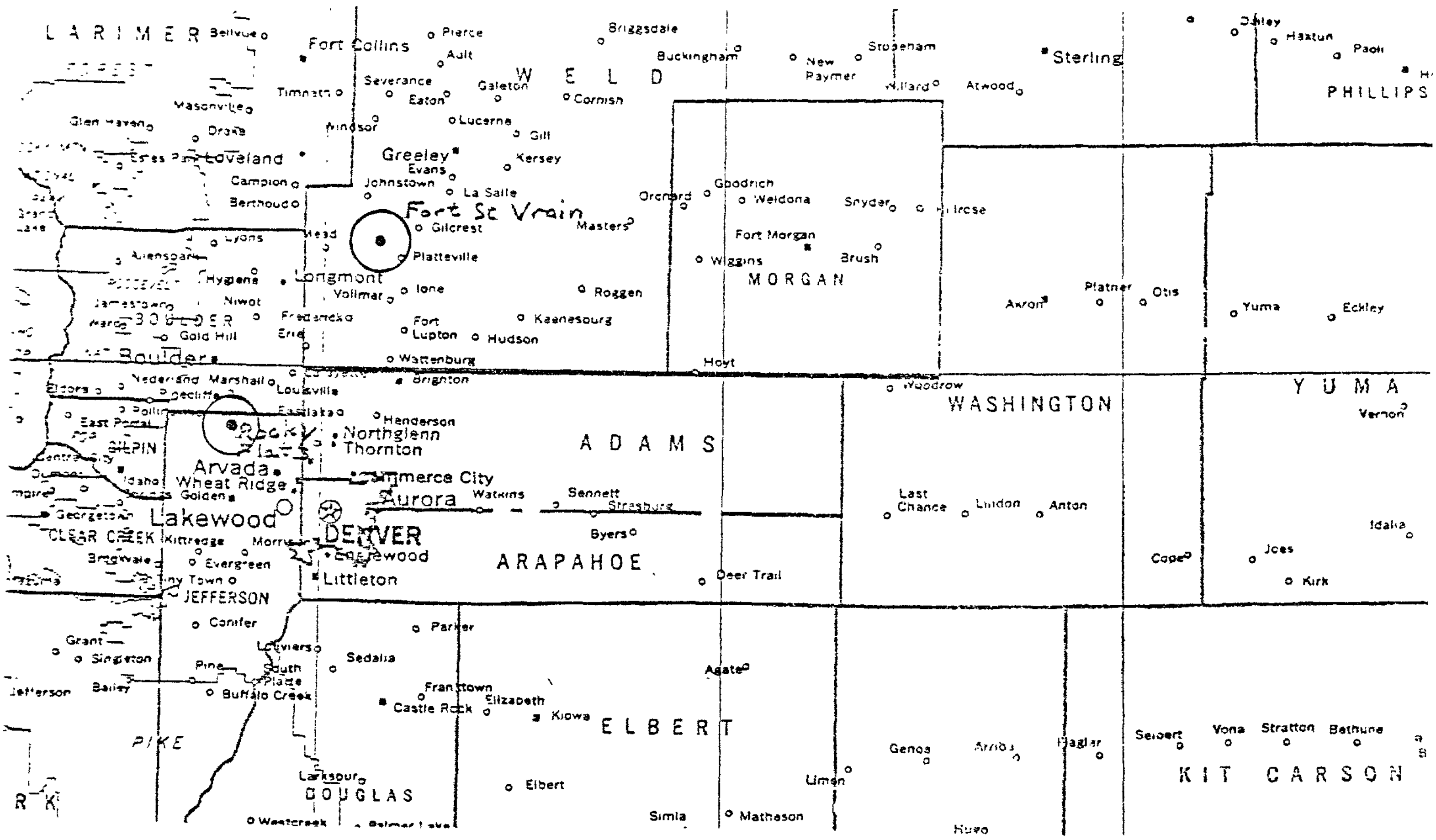
Radiofrequency/Microwaves

One situation in Region VIII which deserves attention is the Lookout Mountain "antenna farm" just west of Denver. The NIR exposure levels there are significantly elevated with respect to average levels in the nation. To illustrate this point, 99.4% of the U.S. population is exposed to $1uW/cm^2$ NIR or less. Measurements taken on Lookout Mountain in 1978 were up to approximately $19uW/cm^2$ and new antennae have been added to the "farm" since then. Levels such as these result in interference with electrical equipment such as stereos, but whether they adversely effect human biological systems directly has not yet been established.

VI. Emergency Response Planning

Fort St. Vrain

Following the accident at the Three Mile Island nuclear plant, President Carter ordered that a radiological emergency response plan (RERP) be developed for every commercial nuclear plant. Typically the RERP is prepared by the state and utility, and federal agencies, chaired by the Federal Emergency Management Agency, review, comment, and approve of the plan. EPA has specific responsibilities in these plan reviews, and participates in an umpiring role in the annual exercise and critque of the RERP. The Ft. St. Vrain nuclear generating plant now has an approved RERP. An update of the plan is expected in the near future. EPA will participate in the evaluation.



Potential Evacuation

	Area(mi2)	Population
Fort St. Vrain	78	2100 (1982)
Rocky Flats Plant	50	500 (1979)

Figure XIII   Region VIII Emergency Planning Zones

Rocky Flats

The Rocky Flats Nuclear Weapons Plant located just northwest of Denver developed an RERP which has been reviewed by the State of Colorado. Federal agencies, including EPA, have umpired one of the exercises of the Rocky Flats plan. In addition the EPA Region VIII Radiation Programs Office, at the request of the Colorado Department of Health, is participating in the assessment of the Rocky Flats "maximum credible accident" on which the RERP is based.

Figure XIII indicates the proximity of facilities along Colorado Rocky Mountain front range, and the relative location of Denver and surrounding towns.

VII. Indoor Radon Progeny

Several areas in the nation experience elevated levels of radon gas exhaled from soils. These are typically mineralized areas such as the Rocky Mountain Region. When radon is released to the atmosphere, it is immediately diluted to inconsequential concentrations by the ambient air and especially by breezes. Radon which finds its way into homes, however, becomes trapped and decays to further radioactive species which can accumulate to levels that are associated with significantly increased lung cancer risk (Figure XIV). Energy conservation measures which reduce ventilation rates also increase the radon daughter concentrations in homes. In 1978 the Montana Department of Health and Environmental Sciences discovered elevated radon daughter levels which exceeded EPA guidelines (in many homes in Butte). Realizing the public health implications of radon in homes and the state of the art of radon daughter measurement, the Office of Radiation Programs sponsored a study of measurement techniques using Butte as a laboratory. This is the most extensive study of radon daughter measurement techniques ever attempted, and it will soon be completed. The study does not address techniques for lowering the radon daughter concentrations in homes, however. Many such remedial alternatives have been proposed and implemented, but no study comparing cost and effectiveness has been attempted. The results of such a study would be very important as the nation strives to tighten residences against air infiltraton.

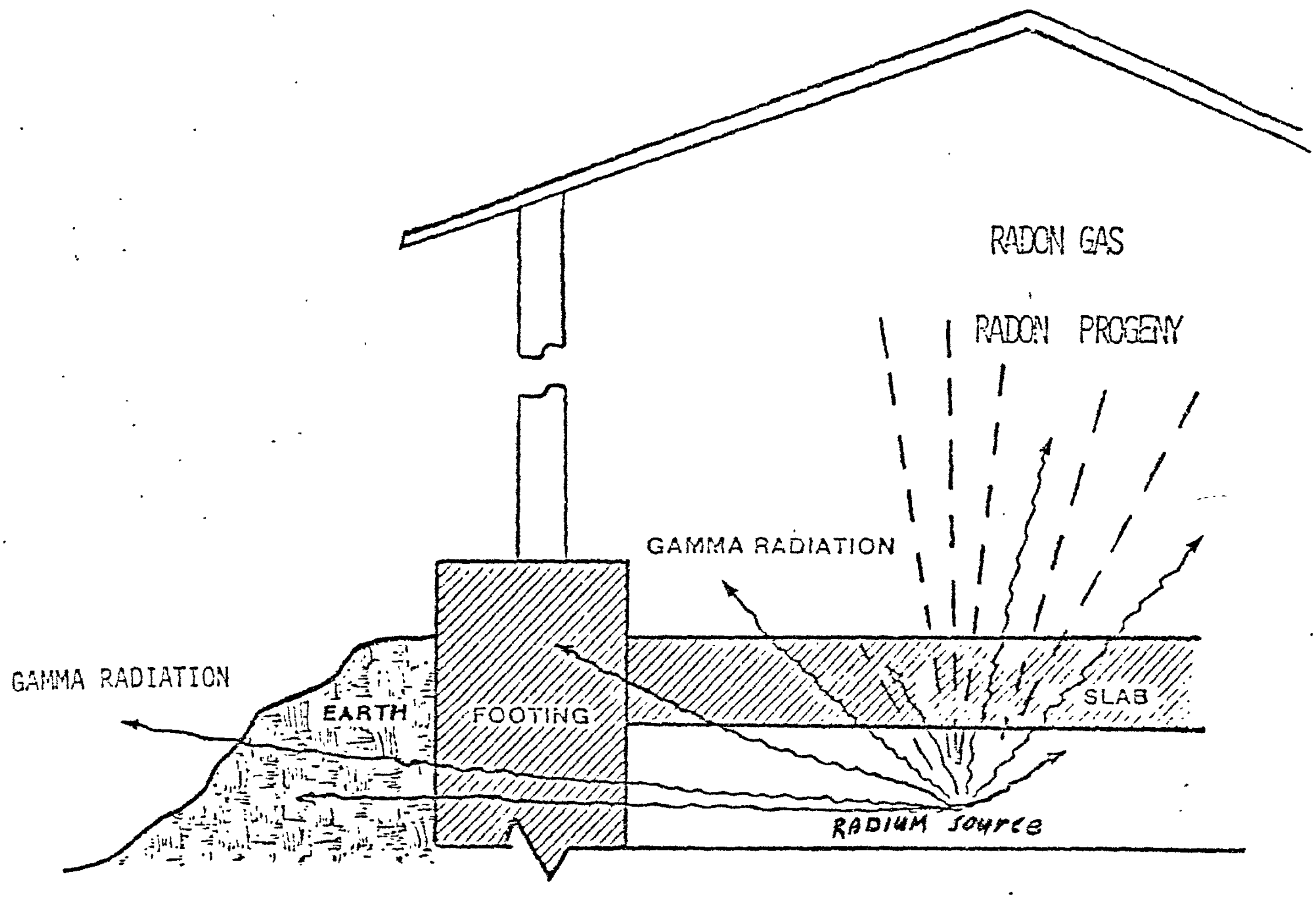


Figure XIV Routes of Radon Entry into Homes

VIII.

Pesticides and Toxics Section
Environmental Management Report

REGION VIII ENVIRONMENTAL MANAGEMENT REPORT
PESTICIDES AND TOXICS

I. OVERVIEW: STATUS AND TRENDS

Our view of the current status and our insights into possible trends come from continued involvement with state agencies on pesticide and toxics issues regarding state inspection and complaint response activities under FIFRA, as well as on annual analysis done to establish enforcement priorities. Additional information on toxics problems in air and water is provided under the media in which they occur.

Some very general long-term trends have been observed to date. Generally, fewer pesticide poisonings seem to be occurring in recent years, possibly due to child proof pesticide containers and the fact that organophosphate pesticides are being respected for their acute hazard potential. We expect the year-by-year data in future Environmental Management Reports to reflect this trend. As discussed in this paper, definitive trends regarding drift and disposal of pesticide containers have not been observed.

Certain Region VIII states are especially concerned with unique pesticide problems. Montana is concerned with the buildup of endrin residues in the environment and the buildup of certain pesticides in game birds. Wyoming, Montana, Utah, Colorado and South Dakota are very interested in the use of 1080 for coyote control, and if the Administrator allows the use of this chemical, EPA will have to work closely with the states to implement proper programs for its use.

Regarding the asbestos-in-schools program, we are aware of several asbestos removals at schools but at this time our data are not compiled in a manner so as to allow us to assess the true status of removal actions. After the mandatory rule takes effect requiring schools to keep records, we will have better figures for future Environmental Management Reports.

Methods of disposing of PCBs are still in the developmental stages and disposal costs remain high. However, we are observing significant quantities of PCBs being moved toward disposal facilities. We are attempting to gather actual figures on the flow of PCBs for disposal from Region VIII, and we hope to have more definitive information in future Environmental Management Reports.

It has been suggested that the Region might rely upon published scientific studies for indications of the status and trends of pesticides in the environment. A major constraint in using existing published research to define the extent of these pesticide impacts on human health or the environment is that in most cases, the data has not been collected on a systematic national or regional basis over a long enough period of years to enable one to evaluate trends. Isolated short-term studies of limited geographic scope have been done to assess acute and chronic health effects of pesticide exposure or to monitor the residues of particular pesticides. For obvious reasons, these cannot be relied upon as annual measures of environmental quality. Nevertheless, even if there were regional data available, trends of pesticide residues in the environment would still not be clear. The likelihood of pesticide exposure is dependent upon the nature and occurrence of pest infestations which will vary from year to year, and the types and extent of pesticide usage. For these reasons, it is impossible to extrapolate available published research for a regionwide analysis of the impacts of pesticides on humans, fish and wildlife or the environment.

II. SIGNIFICANT PROBLEMS AND IMPLICATIONS: PESTICIDES

A. Pesticide Contamination of Wildlife

Pesticide contamination of wildlife is a problem of unknown but possibly large dimensions within Region VIII. Sparked by the findings of surprisingly high Endrin levels in waterfowl and upland gamebirds in Montana in 1981, literature searching and monitoring efforts were begun to gain a better understanding of the scope of the problem. With additional monitoring, several other persistant hydrocarbons of both industrial and pesticide origins have been detected. Because the paths of the Pacific and Central waterfowl flyways cut through the Region, identification of exposure patterns is difficult.

National pesticide residue studies have been conducted by the U.S. Fish and Wildlife Service Research Center Lab in Patuxent every three years on starlings and ducks. The data have not yet been summarized so as to allow conclusions or identify trends. The Region is working to digest this information and will include it in future reports.

A recent incident involving the organophosphate pesticide, Phorate, indicated that significant birdkills might also occur after proper application of the pesticide. This might suggest unexpected risks to the general population and to waterways.

Data collected at several laboratories have shown elevated levels of heptachlor and heptachlor epoxide, a pesticide with only limited labelled uses in this region. The presence of this pesticide and residue in both migratory and non-migratory birds is very difficult to explain using data involving legal usage of the parent pesticide.

B. Pesticide Misuse

Violation of pesticide label conditions is one of the more serious environmental problems related to pesticide use. Impacts from misuse include damaged crops, human effects, environmental residues in wildlife and crops and in some cases a general accumulation of chemicals in the natural environment. It is necessary that EPA maintain an enforcement program that draws attention to such misuse through rigorous inspections of users by state inspection personnel and active pursuit of case preparation against violators.

C. Pesticide Drift

Pesticide drift, measured as non-target vegetation destruction by herbicides, is another problem in Region VIII. Drift problems occur when applicators spraying fields inadvertently spray neighboring fields, shelterbelts or other adjacent properties. In Region VIII, the destruction of sunflower crops by applicators spraying 2,4-D on small grains is the most common type of rural drift complaint. The encroachment of residential areas near agricultural lands also leads to drift incidents.

D. Pesticide Drum Storage and Disposal

Pesticide drum storage and disposal requirements will be tightened under RCRA regulations. It is possible that these tighter requirements could mean an increase in illegal disposal of these drums or their contents. There is no data to indicate the present fate of pesticide drums. Montana State personnel are concerned that these drums are being used without proper prior cleanup as pier supports, otherwise disposed of near water sources, or used as barbeques and garbage cans. Given the lack of information and the possibilities of serious health and water quality impacts, drum disposal has been identified as an issue for further investigation.

SIGNIFICANT PROBLEMS AND IMPLICATIONS: TOXICS

A. Asbestos

EPA is concerned with the disease-causing potential of intermittent, low-level exposures to asbestos that can occur in some school buildings. The durability of asbestos fibers, their small size and fibrous shape allow them to remian airborne for long periods of time. Some fibers which are inhaled will remain in the lungs indefinitely. Under the Section 6a of the Toxic Substances Control Act, the Agency has taken steps to minimize the exposure of school children to asbestos.

In Region VIII, information was distributed to the states and school districts informing them of the asbestos problem and recommending that each school locate the amount of friable asbestos in their building(s) and take action to remove or safely contain that material. Because of the voluntary nature of the asbestos reporting provisions of the regulations, it is impossible at this time to present meaningful statistics on the number of school districts which have identified asbestos or taken action to remove or encapsulate it. By early 1983, the Region VIII Asbestos Technical Advisor had visited 615 of the 746 school districts in Region VIII (excluding Montana). Also, approximately 268 Montana school districts of the 393 districts in the state responded to a questionnaire indicating that they have inspected their buildings. No reliable statistics on asbestos found or removed are available at this time.

B. PCBs

Because the Agency's responsibilities for PCB's do not include environmental monitoring, it is difficult to arrive at a meaningful environmental quality measure with which to assess the effectiveness of EPA's regulatory efforts. One possibile measure might be the amount of PCB's from Region VIII which are destroyed each year compared to the amount of PCB's which are estimated to exist in the Region. However, the accuracy of the published figures on existing amounts of PCB's in the Region is questionable, and it is not clear at this time whether the waste destruction companies will be able to provide us with information on the amount destroyed.

III. EMERGING ISSUES

Based upon the staff's involvement in regional toxics and pesticides issues, we can identify several important emerging issues which merit the Agency's attention:

1. Contamination of groundwater
2. Non-target impacts caused by pesticides
3. Identification of problem chemicals
4. Use of pesticides in irrigation sprinkler systems

1. Groundwater contamination is the Region's potentially most serious emerging problem. Groundwater quality is threatened by mining, mineral and uranium exploration, oil and gas development, deep well injection of wastes, and chemical contamination of recharge zones. Little baseline water quality or groundwater movement data is available, and a comprehensive effort is needed to collect data upon which protective or remedial actions might be based.

2. Non-target impacts caused by pesticides are also a potential problem of undefined dimensions within the Region. The Regional Office and the States receive numerous complaints about damage to nontarget species resulting from pesticides such as herbicides, chlorinated hydrocarbon pesticides, paraquat and the organophosphates. However, there is no broad surveillance network except the annual songbird census through which to gather the statistical information needed to determine the extent of this environmental impact.

3. As the Region becomes aware of problem chemicals which have not been recognized as hazardous under TSCA, the Regional Toxics program will bring these chemicals to the attention to EPA Headquarters and the appropriate state agencies. These chemicals might be identified through inspections, complaint information or contacts with other governmental agencies.

4. Recently, it has come to our attention that chemical companies are beginning to market the idea of using certain pesticides in center-pivot irrigation sprinkler systems. Our concerns about this practice include the possibility of the pesticide back-flushing into the water source through inoperable or non-existent back-siphoning valves; exposure to the public through unattended, runaway sprinkling systems; and exposure to the employees using the pesticide and working in the fields. Secondary concerns involve the ability of such systems to deliver the proper concentration to the crop.

ATTACHMENT A: MEDIA OVERVIEW - PESTICIDES

There are no statistics available on the amounts of pesticides used in Region VIII. However, we do know that there are approximately 56,500 private applicators and 10,200 commercial applicators who are certified to apply restricted use pesticides in Region VIII. These figures do not include homeowners or other users who apply non-restricted use pesticides.

EPA has collected some data on possible damage measures for estimating the misuse of pesticides in the environment: fish kills, pesticide use violations, non-target vegetation destruction by herbicides (pesticide drift), and acute and chronic human health effects. The data on the extent of the problem in each of these areas is sketchy. Much of what has been reported in the past is scattered in complaint files of the Fish and Wildlife or Agriculture agencies of the States or Federal Government. Some misuse incidents are never reported.

We are requesting data from each of our states on the reported instances of fish kills due to pesticides. Historical fish kill data have been retrieved from the STORET system and are presented below. It should be remembered that this information is based only upon incidents which were reported by state or Federal agency personnel.

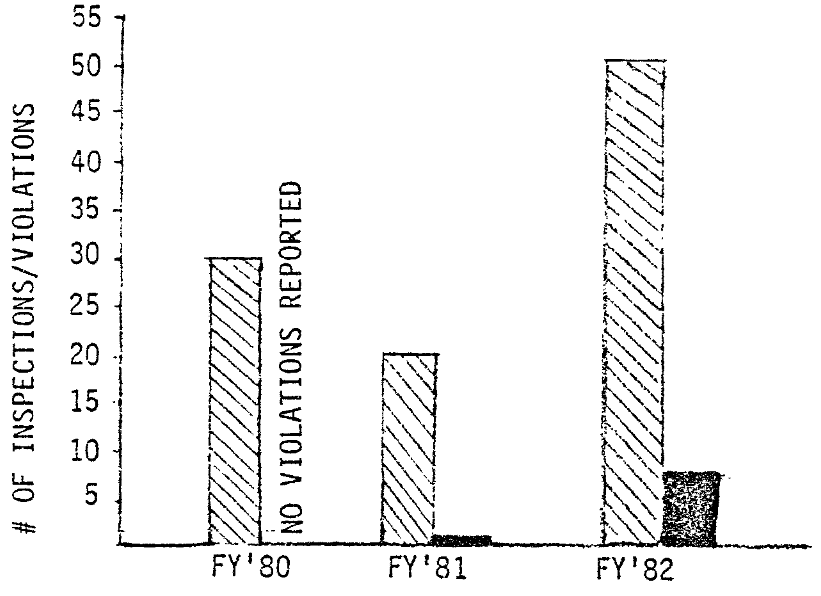
Table A: SUSPECTED PESTICIDE-CAUSED FISH KILLS, 1960-1980*

	CO	MT	ND	SD	UT	WY
Suspected Pesticide-Caused Incidents	5	27	3	3	5	4
# of Fish Killed	37650	51850	49900	110000	7670	2308
Total # of Fish-Kill Incidents(all causes)	42	66	30	24	37	40
# of Fish Killed	1521119	520118	616600	559297	93745	86818

* only includes agricultural incidents reported to state or federal agencies; does not include fish kills caused by spills occuring during transport or manufacture of pesticides. Based upon best available data.

Data obtained from STORET

Pesticide use violations are documented in the course of pesticide dealer and applicator inspections conducted by EPA and the States, and also in the course of following up on complaints reported to either the Regional Office or the states. Tables B and C on the following page depict pesticide use violations which were taken from EPA's inspection and complaint records for Colorado and Wyoming, where the Agency has primary enforcement authority. Tables D thru F present information from the State Enforcement Grant reports.



Based on information from EPA R8

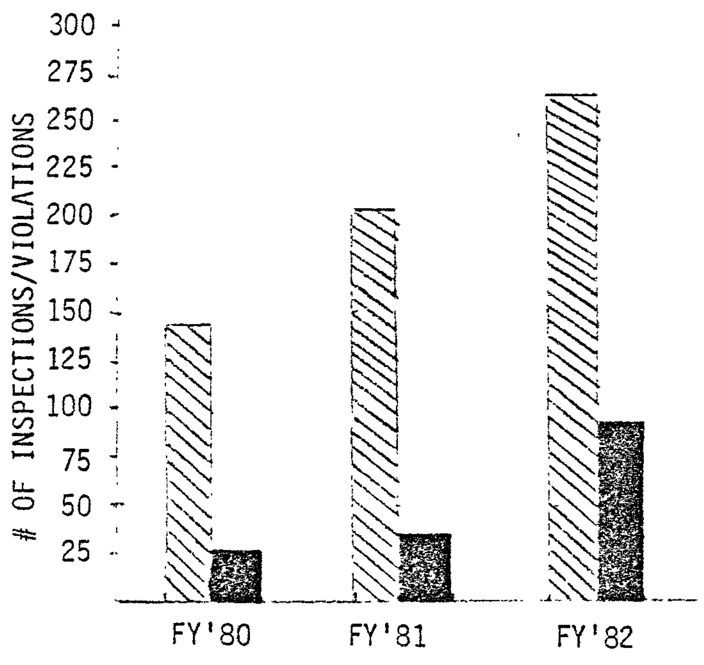
TABLE B:

WYOMING

PESTICIDE USE INSPECTIONS
AND VIOLATIONS

INSPECTIONS

VIOLATIONS



Based on information from EPA R8

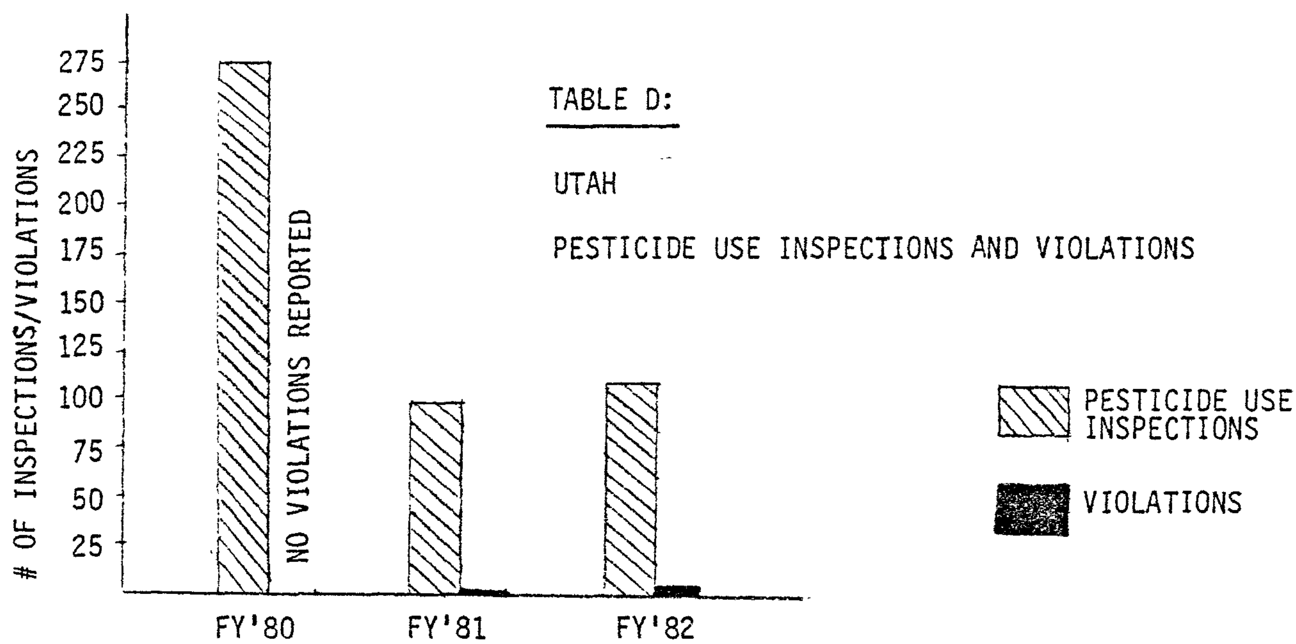
TABLE C:

COLORADO

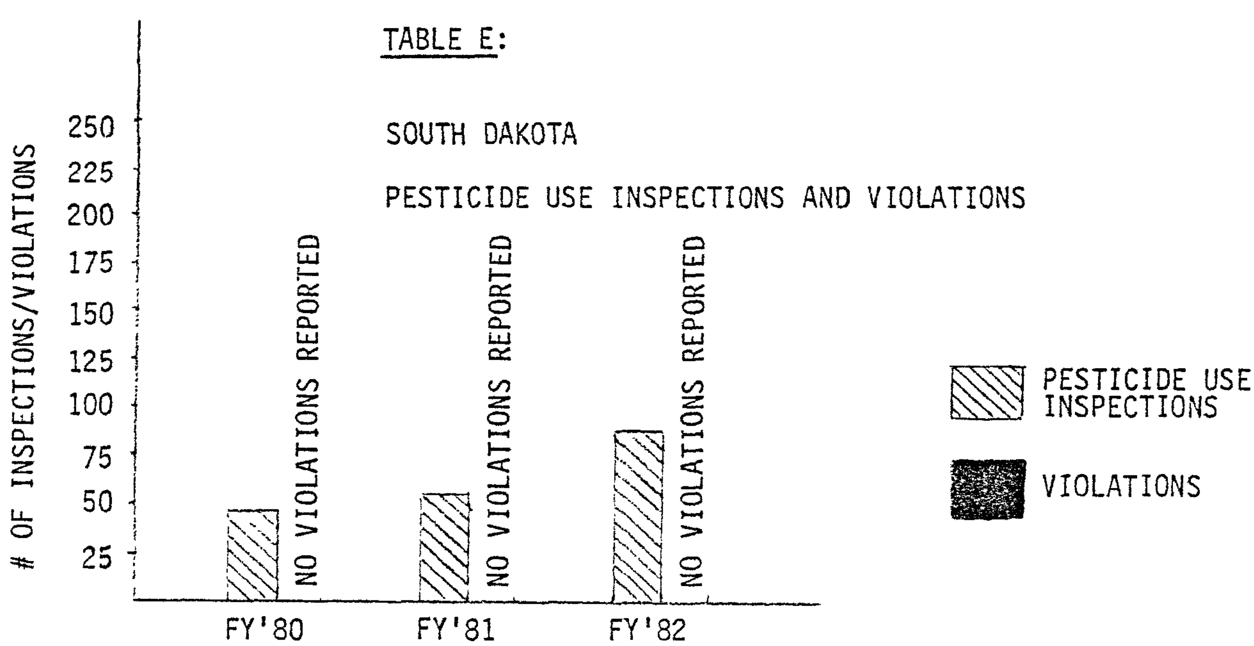
PESTICIDE USE INSPECTIONS
AND VIOLATIONS

INSPECTIONS

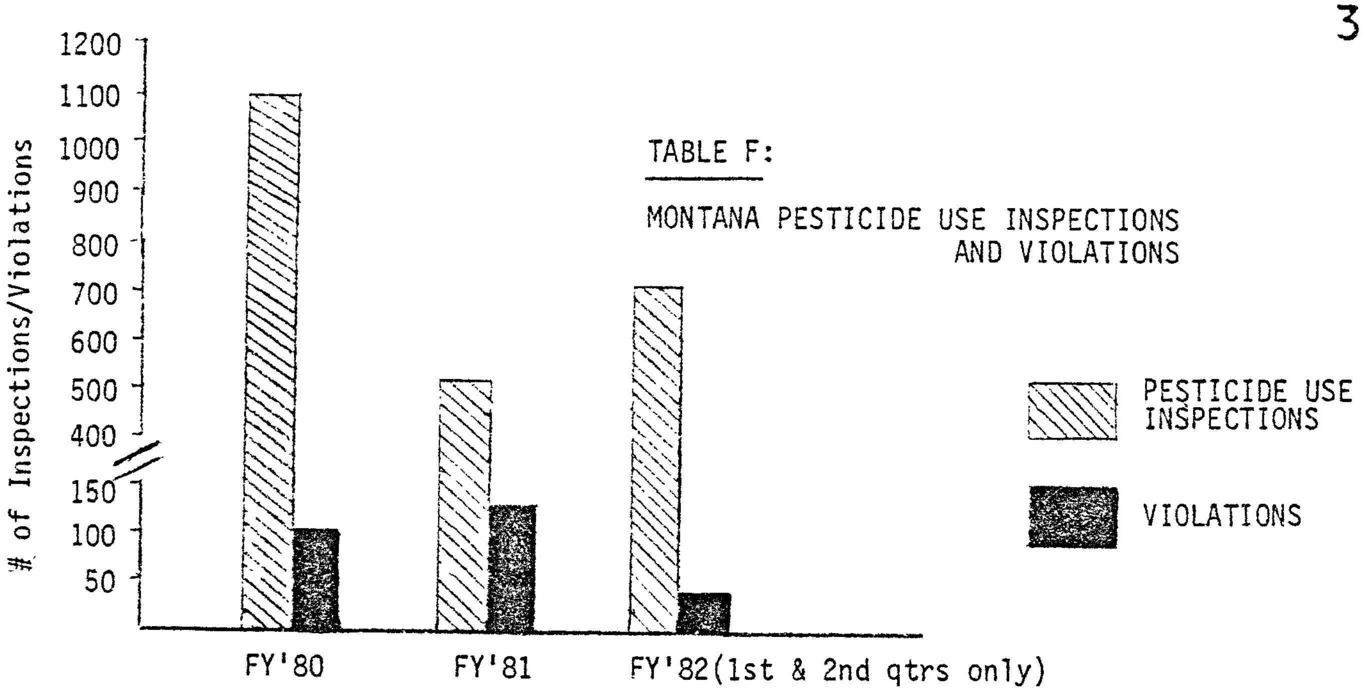
VIOLATIONS



Based on information from State Enforcement Grant



Based on information from State Enforcement Grant

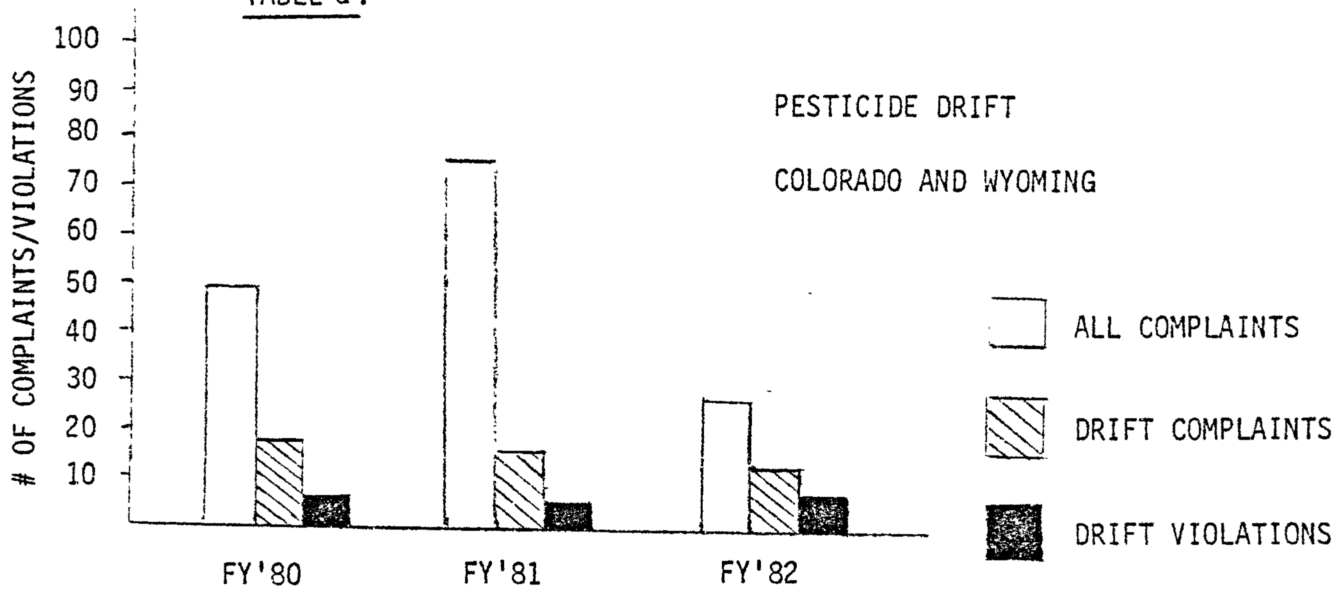


Based on information from EPA Montana Office

In order to characterize the problem of pesticide drift, Tables G and H were developed from information in the Region's complaint files for Colorado and Wyoming and from responses that we received from the other states. They illustrate the number of times damage has been reported due to pesticide drift.

Information on chronic human health effects due to pesticide poisoning is currently not available for the Region. Some information on acute human health effects is located in the files of Poison Control Centers and hospital emergency rooms. It should be kept in mind that many incidents of this type go unreported. Table I on page 12 depicts the poisonings reported to the Rocky Mountain Poison Control Center during 1981 which were pesticide-related. The total number of incidents reported represents all the cases which the Poison Control Center handled during 1981, and includes cases from 50 states and the District of Columbia. There were 46,264 cases (all causes) from Colorado. No breakdown for Colorado or Region VIII states was available for the number of pesticide poisonings.

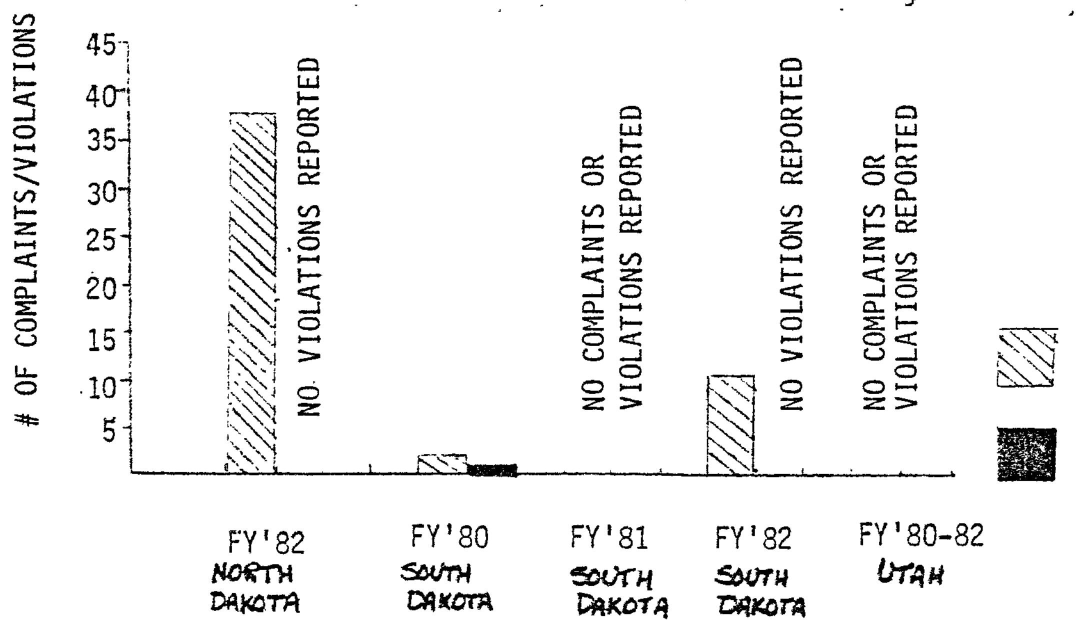
TABLE G :



Based on information from EPA R8 & WY Dept. of AG

TABLE H :

PESTICIDE DRIFT: NORTH DAKOTA, SOUTH DAKOTA, UTAH



Based on information from State Enf. Grants & ND Ag Dept. letter

Table I: Poisonings Due to Pesticides--1981
Rocky Mountain Poison Center

PESTICIDES

HERBICIDES

2-4-D	162
*Paraquat	7
Triazine	25
Urea	3
Dinitrphenol	25

INSECTICIDES/FUNGICIDES

-Carbamates	277
-Chlorinated hydrocarbons	471
Insecticide Repellants	121
Metaldehyde	9
Napthalene	95
Piperonyl Butoxide	63
Pyrethrins Pyrethroids	155
-Organophosphates	627
Rotenone	12
Sabadilla	1
Avitrol 4 Aminopyridine	0
Benomyl	3
*Cycloheximide	3
Dichlone	3
Phthalemide	13

RODENTICIDES

Antu	0
Arsenic	4
*Fluoroacetate	4
Phosphorous	9
Vacor	5
Warfarin	368

FUMIGANTS

*Methyl Bromide	8

TOTAL (ALL PESTICIDE-RELATED): 2,473 Cases

*Restricted Use Pesticides

-Class of Pesticides Which Includes Restricted Use Products

Total number of poisoning cases (all causes) handled by the Rocky Mountain Poison Control Center during 1981: 60,828 cases.

ATTACHMENT A: MEDIA OVERVIEW - TOXICS

A. Asbestos

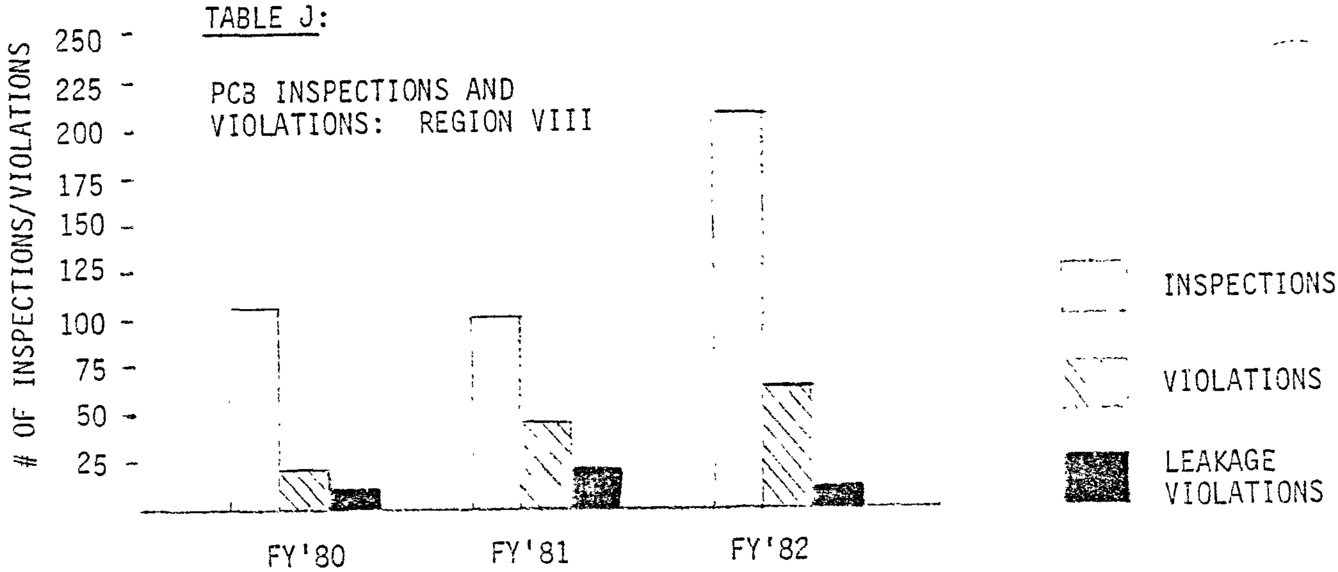
After May, 1983, the Technical Advisor will begin revisiting the districts which during his first trip had identified schools with friable materials possibly containing asbestos. After this second round of visits, it should be possible to present better data on asbestos problems in Region VIII schools.

B. PCB's

Some secondary measures for which the Region can produce data would include the compliance ratios or numbers of "serious violations" for facilities within the Region which have PCB's. Serious violations in this case would be spill or leakage violations. However, these compliance or violation figures would not give the reader a true picture of the presence or absence of PCB's in the environment. Table J below characterizes inspections and violations in Region VIII.

TABLE J:

PCB INSPECTIONS AND VIOLATIONS: REGION VIII



Based on information from EPA R8

Region 8 Environmental Management Report

EPA EPA-908/9-83-001 May, 1983